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They'd Rather Be Right BY MARK CLIFTON and FRANK RILEY

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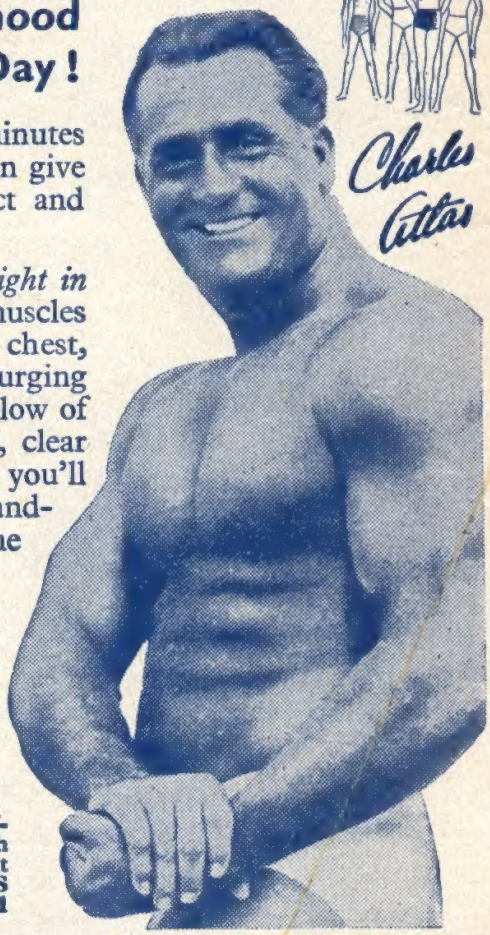

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Astounding
SCIENCE FICTION

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• **NEXT ISSUE ON SALE JANUARY 20, 1955** •

Editorial

"MY WILLIE CAN DO ANYTHING"

PRESIDENT Eisenhower has stated that there is no need to develop greater bombs than those now available—the 45 megaton hydrogen-lithium bomb type.

The hydrogen bomb is not the most horrible weapon, nor is it going to be a "weapon so horrible as to make war impossible." The reason it represents the ultimate in bombs is simply that it is powerful enough to annihilate any terrestrial target, and by simple methods could be turned, quite literally, into that science-fictional device, "the planet-wrecker" bomb.

The physical scientists are being held responsible for this horror-weapon; necessarily they are, in a sense, but it is time, I think, to apply some painfully honest thinking to the problem. The thinking that follows is painful; it may be wrong—but it should, I sincerely believe, be given some consideration.

If a man goes out into the woods and comes back with a deer, that may be luck. Maybe the deer tripped over its own feet and just lay there. But if he goes out into the woods every ten days, for seventy years of his life, and comes back with a deer every time, it is at least worth asking whether it's luck, or, possibly, due to something he does himself.

If there is, on the other hand, a man who goes out in the woods, and comes home with no deer, but a skinned pair of shins and a black eye, that may be bad luck. But if he goes out every ten days for seventy years, and comes back bruised, skinned, cut, and with broken limbs repeatedly for all those years—it indicates something is wrong with the gentleman's thinking. If there *are* evil spirits at large in the woods, he'd better find out their exact nature. It's futile to make the same mistake for that length of time.

Recorded history runs for almost exactly one hundred times seventy years—and Man's civilization has, for all that time, gone out in the woods and come back badly mangled by War. I suggest that it's time to suspect that maybe Society and Civilization must have some built-in mental bloc, some fundamental error. It can't all be blamed on bad luck—not seven thousand years of it.

If there is a Bad Luck spirit, then, let us seek to precisely locate, define, and describe that spirit, and do something more effective about it.

The traditional answer has been "Men are irrational," or a variant of that thesis.

Now some years back, a safety engineer designed a gadget to protect the hands and arms of workers using high-power punch-presses. It consisted of a pair of handcuffs linked to the machine in such a way that the machine would not operate if the worker's hands, wearing the cuffs, were in the danger area. Here was a worthy idea, for the benefit of the men who were working on the machines.

They refused to wear the gadgets; they simply tied them out of the way, and went on as before.

Now a safety engineer's job is to get production—results. His theory that men *ought* to wear these handcuffs appeared sound; the fact that men wouldn't, however, was an overriding consideration. They tried lecturing the men, tried ordering them to wear the handcuffs—tried a lot of schemes.

Being engineers, however, rather than moralists and philosophers, or political-sociological-psychological theorists, they accepted that it was an evident fact of observational experience that the men would not wear the handcuffs.

So they tried a safety device consisting of *two* push-buttons. The machine wouldn't work until both buttons were pressed simultaneously, and the buttons were so placed that they took two hands.

The men found that a small piece of wood and some Scotch tape would hold one of the buttons down, and allow them to work the machines the way they wanted to work them—with one button.

Having learned from the handcuff idea, the safety engineers didn't do so much preaching on this failure; they accepted the old engineering—and practical!—axiom. "You can't fight City Hall." And you can't fight any force of Nature; you learn to work with it, not against it.

Now human beings are the results of three billion years of evolution—which makes them a Natural force, if you stop to think about it. The distinction between Nature and Man is precisely as fundamentally unsound as the distinction between Trees and Nature. If a tree grows in a certain way, the wise man will assume that there's some reason why it does so—even if his human wisdom is not yet competent to determine that reason.

It seems somewhat strange that the same thinking cannot be applied to human beings, doesn't it?

The safety engineers have finally come up with an answer to the problem—and, now they have it, they agree it's the answer they should have tried in the first place. A workman can accomplish most when he can concentrate on his job, and not spend time, effort, and attention babying a machine. Make the machine look out for him; don't make the workman look out for the machine! The man, now, wears a small ring on one finger of each hand; the ring contains a tiny trace of radio-active material. The machine has a radioactivity detector built into it; it can't operate if the man's hands are in the danger area—it looks out for him.

Society, a civilization, is intended to act as a tool, a machine, which human beings use. Man built Society; Mankind owes no debt of gratitude whatsoever to Society, because it is his product, built by his own hands, for his own use. If that machine is defective, then it needs to be changed—and it has *no right to seek to change Man.* Society is a machine built by Man; neither more nor less. Society is not God; it didn't create Man.

But it bids fair to destroy him.

Man *is* imperfect, and all the products of Man are imperfect. Society is one of those products; unfortunately it has a vast reluctance to acknowledge that, although it cheerfully points out that Man is imperfect, and that Man's actions are tainted with large dobbets of unwisdom. Quite so; but let us not forget that constructing Societies is one of those typically human activities. Man and certain insects evidently have an instinct to create societies. If Man's instincts are "animal instincts," and to be suppressed and vilified—then what shall we do about Society?

The Society Engineers, for seven thousand years, have been trying to make the workers wear the handcuff devices that are, theoretically, the way to safety. Their orations have, for seven thousand years, failed to work. Maybe we'd better redesign the machine, instead of insisting that Man is wrong? The workers who refused the trick safety-gadgets were right, the safety engineers wrong. The final solution, which the men accept, is a far sounder approach than the handcuff contraption. The great difference of situation is that an engineer is used to accepting that the situation is invariably what it *is*—not what he thinks it ought to be.

The moralists, philosophers, *et al.*, evidently do not have the right approach. That's not an opinion, so much as a sort of engineering comment. There's been quite a succession of models tried out, and they've failed with remarkable consistency. Ur—Sumeria—Egypt—China—Angkor Vat—Persia—Greece—Rome—Incas—Mayans—Islam—quite a few models. An engineering firm that had a record like that would be considered subject to considerable disfavor. There must be a mistake in the approach to the problem.

There's an old saying "A poor workman quarrels with his tools." Then it's a poor Society that quarrels with its tools—human beings. Personally, I think three billion years of evolution is more apt to find some basic wisdom than a few thousand years of brilliant speculating. We haven't yet come up with a Society that can unite the efforts of men of all creeds, breeds, and colors—but our own, internal economies somehow unite in mutually supporting such wildly differing units as muscle cells, liver cells and bone cells. My, we could learn a lot of wisdom from those old animal instincts!

Maybe Society does have a deep, basic error. Let's look for it.

The Societies of all the empires mentioned above have united in a very basic approach to the problem of living in the world; each developed Logic and Pragmatism. Greece and Rome didn't invent logic, mathematics, or engineering; the very concept of "empire" intrinsically implies the existence of those concepts. Egypt's mighty engineering works were older, when Caesar bridged the Rhine, than Rome's are today. Logic yields mathematics, and pragmatism yields, with mathematics, engineering. And those are the underlying common-approach systems that you'll find in any empire of history. I don't say they're the *only* factors; you'll also find religion in each, and a food-producing economy of some kind, and some sort of regulation of the relationships between the sexes. But the last three you'll also find in any primitive tribal culture.

Let's study the business of logic and pragmatism a bit. If you run over in your own mind, the general trend of the teachings our Society advocates, you'll find

the essential judgment expressed is "All possible problems can be solved by logic."

The consequences of this proposition appear at a conference table. If Group A finds that Group B will not agree with them, under circumstances where Group A is being logical, and has data which correlates with their logic—fulfilling the requirements of logic-pragmatic approach—then Group B is held to be irrational, or is held to be of evil, or improper intent.

Training in childhood is based on the proposition that, if a child will not conform with the wiser dictates of parents, they must be punished to make them understand, be more rational, or "better." In the case of small children, the concept is valid.

In a logic-pragmatic-limited system, there appears to be no other answer; if logic fails, then pragmatic—physical—methods must take over.

When cultural groups are involved, the usual expression is "Those beggars need to be taught a lesson!" at the informal level, followed by a declaration of war as the more formal expression of precisely the same philosophy.

Now let's leave the highly-emotional level of human affairs for a bit, and note that Euclidean geometry is an absolutely logical development of the basic postulates from which the system starts. There are several other geometry systems now known, each equally, absolutely logical, which start from different postulates. Further, each geometry has pragmatic demonstration of its successful application.

But, by definition, postulates and their derivation *cannot be discussed logically.* They cannot, then, be handled within the system of logic and pragmatism; they stem from a higher order, *nonlogical process* called "intuition."

Once Newton achieved the concept of the inverse square law of gravity, it was possible to logically deduce consequences which could be correlated with pragmatic observations. But no *logical* process was capable of achieving the original intuitive leap.

Every human being's every-day experience gives evidence that living does involve nonlogical process as a matter of fact; there is a nonlogical process by which we derive things we call "postulates" or "beliefs."

The problems arising at this level cannot be discussed logically, because they are intrinsically nonlogical. You cannot logically deduce a conclusion from many simple statements that, none the less, can be evaluated and handled by any human being. "I never tell anything but lies. Do you believe me?" expresses a problem that can *not* be logically analyzed—but if a human being makes such a statement to you, you can in fact work with it.

When Group A at the conference table finds Group B in disagreement, there is the large area of possible semantic difficulties to be cleared away. If you call a thing "table" and I call something which appears to be the same "orthtol," we might be involved in a semantic confusion if my "orthtol" happens to be your "four-legged."

[*Continued on page 118*

THEY'D RATHER BE RIGHT

First of Four Parts. *They tried to smash "Bossy," the hyper-computer. Joe and his strange friends saved the machine —but that wasn't necessary. You can't smash an idea—and the idea was bound to grow again anyway! But people can hate an idea.*

JUST ahead, on Third Street, the massive façade of San Francisco's Southern Pacific depot loomed, half hidden in the swirling fog and January twilight. Joe Carter pulled his rented pickup truck to the now deserted curb, and squinted appraisingly into the gloom. The warning had come, the usual tingling up and down his spine, the drawing sensation at the nape of his neck.

He sent an expanding wave-field ahead of him, a telepathic inquiry, but there were too many people around the depot for him to sort out the specific source of danger without first knowledge of a focal point. The static of general anxiety, grief and gladness, which always seems to hang over a depot like a pall of smoke, prevented him from finding any menace directed toward himself.

And on the outside of the depot the scene was quite normal. The blurred yellow lights of a taxi pulled out of its reserved section and turned down Townsend Street toward the Embarcadero. The muffled rumble of traffic on the long overhead approach to the Bay Bridge was an audible accompaniment to the esper hum of half vocalized words and phrases picked up from the minds of the people all about the area.

He watched a police car cruise slowly by and disappear into the fog. He

By MARK CLIFTON AND FRANK RILEY

Illustrated by Freas

sampled the stream of consciousness of the two officers. Their casual glance had registered him in their minds: male truck driver, white, about twenty-two, no obvious disfigurements, not breaking any law at the moment. But there was no recognition.

He swept the street again with his physical eyes, and almost passed over the skid-row wino who had drifted a little far south of the usual haunts. The fellow

had stopped in the chill shelter of a darkened store front, and was apparently drinking with desperate thirst from a wine bottle held in a paper sack. It was so usual, so completely in character, that Joe very nearly made the mistake of not penetrating. But even as he started to flick his eyes onward, his nape muscles contracted more sharply, heightening the awareness of danger.

Still doubting that the somatic price he must pay for sharing the wino's hopelessness and dejection would be worth some bit of factual information drenched in it, Joe pierced.

He got a series of photographs, sharp and clear.

The Federal agent's disguise was near perfection. Joe chuckled silently, with genuine amusement. In rinsing the wine in his mouth to give him a breath, just in case another bum stumbled up to him, the agent had inadvertently swallowed a slug of the cheap stuff. With him, and as clearly, Joe felt the somatic effect of the wine in the man's nose, mouth, throat and stomach.

But the agent's disgust did not wash out the dominant picture in his mind. He had recently been briefed, and his upper stream of consciousness still carried the conceptual images.

Two more agents were inside the depot; one of them standing near the line of people waiting to get tickets validated; the other reading a newspaper over near the hallway which led to the rest rooms.

Within easy vision of both sat their quarry, Professors Billings and Hoskins. Billings had been recognized at the depot in St. Louis where he was changing trains in his flight across the country. Hoskins had not been discovered at all until he had joined Billings less than half an hour ago. There was elation in the agent's mind over the meeting, for it might mean that the end of the long trail was near. Obviously, the two men were now waiting for someone else to join them.

And when someone joined them, it was possible, unsuspectingly, they might lead the agents directly to Bossy.

Up until now there had been absolutely no indication of where the synthetic brain had been hidden. There was disgust and contempt in the agent's mind that during all the years that Hoxworth and other universities had been experimenting in the building of the cybernetic marvel, subsidized with government funds, Washington bureaucracy had not realized the significance of it. It had taken an uprising of the people, themselves, to drive home to Washington how man would react to the destruction of all his previous concepts on how the human mind worked and the values it assumed were absolute.

Someone had said then that this machine was more important than the atomic bomb had been forty years ago; that the implosion of its significance upon man's psyche might do what the atomic bombs could not do; that man has a way of surviving physical destruction, but there was a large question of whether he could survive self-knowledge.

"You are so right," Joe murmured, and lit a cigarette to heighten the impression that he had stopped to rest his shoulders and neck from arduous driving.

The agent's orders were quite clear. Professors Hoskins and Billings were the central figures in developing the synthetic mind. The trail of these two men, sooner or later, would lead to Bossy. Until then, they were to keep the two professors under unsuspected surveillance; were not to concentrate enough

agents to arouse suspicion; were to make an arrest only if the actions of the two men forced their hand.

Joe drew on his cigarette, and probed to a deeper level. He found what he wanted. The agent was tired, and he was chilled. He doubted that his stakeout position was necessary. The reports were that old Professor Billings, at least seventy-two, was as naïve as a child; that he couldn't elude the typical Junior G-Man, age six. And the agent's stomach was beginning to feel queasy from the raw wine he had swallowed.

He was tired, he was chilled, he was queasy. Joe tied himself into the somatic discomfort, intensified it in himself, fed back the intensified dissatisfaction; picked it up again; oscillated it back and forth between them on feedback principle, stepped up each time—in the way he had watched mob reactions heighten far beyond the capacity of any isolated individual—and waited.

The man began to look down the street toward a small restaurant. He was growing ill. Perhaps the wine had poisoned him. There was the fleeting glimpse of wonder if he would be included on the roster of those killed in pursuit of duty. There was the rational denial of the urge to self-pity. There was the compromise to get a cup of coffee first, to see if that would break the chill, rest him, settle his

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stomach. But, undoubtedly, this was that extreme situation which would justify his leaving his post of duty.

By the time Joe had meshed the gears of his truck to pull away from the curb, the agent was already half-way down the block, hurrying to the restaurant, still clutching the neck of the wine bottle in the paper sack. In case he did die, it might be valuable evidence.

Without more care than an ordinary truck driver would show, Joe drove the pickup into one of the loading docks on the far side of the station. He willed away the last sympathetic waves of nausea from his own stomach, and climbed nimbly up on the ramp. He strolled, without appearing to be in any hurry, through the door marked with the sign of Railway Express.

The clerk looked him over, took in the greasy leather jacket, the oil-stained jeans, the crumpled cap with the cracked visor.

"Yeah?" the clerk challenged. "What do you want?"

"Pickup for Brown Appliance Company," Joe answered easily. "Crate of television parts." No flash of alertness, suspicion, was evident in the clerk's mind. It was confirmation that no one knew of Bossy. He handed the clerk the shipping bill he had obtained when he forwarded the parts of Bossy from a town a hundred miles away from Hoxworth.

"No such package here," the clerk said automatically. There was no real animosity in his voice or in his mind. It was the simple desire to obstruct found in everyone, and often expressed where there is no fear of retaliation.

"Boss called the day crew," Joe said dryly. "They said it was here. Suppose you get the lead out and find it."

The clerk looked at him levelly, and curled his lip in a slight sneer. If this punk's boss had called and got the manager during the day, there might be a stink. He decided to cooperate. He found the crate in the back room, slipped the blade of the hand truck beneath its edge, grumbled at how heavy and bulky it was, and wheeled it out on the loading dock. To his own surprise, he found himself helping Joe load it carefully onto the bed of the pickup.

Joe walked back into the office with the clerk.

"Boss wants me to get a ticket to L.A.," Joe said. "Where do I do that?"

"In there," the clerk said and jabbed a finger toward the door leading to the waiting room of the depot. "You want me to lead you by the hand?"

"No," Joe answered. "Don't like to get my hand dirty."

He walked on through the door and down the corridor which led to the depot waiting room. He knew that the clerk was standing behind his counter with his jaw hanging down and his mouth open. The clerk's shock of being bested at his own game gave Joe the somatic hook he needed to blur the image of himself in the clerk's mind. In spite of the repartee, he would not be remembered. As any courtroom knows, emotional disturbance can call up widely inaccurate dercriptions. Already the clerk was remembering him as a hulking brute of a truck driver with coarse black hair, wide flaring ears and tobacco juice stains on his chin.

At the corridor entrance to the waiting room, Joe paused, and with both psionic and visual sight picked out the two professors. Their disguises were simple, and still intact. The seventy-two year old Billings had had the distinguishing mane of white hair cut short and dyed black. The elaborate gold pincenez on flowing black ribbon had been replaced with garden variety horn rims. His clothes were cheap and nondescript. But far more than such superficialities, Joe had counted on the change in the man's bearing to keep his identity secret. Gone was the assurance of the world-famous figure, known to every child through picture, cartoon, newsreel, the renowned Dean of Psychosomatic Medicine at Hoxworth University. In its place was hurt, bewilderment, incredulity—a lost and tired old man. Even so, he had been recognized and followed here.

Professor Hoskins, at forty, with even less change in his appearance had not been recognized before joining Billings.

The two of them sat there now, according to plan, waiting for Joe to join them to tell them what they must do next.

And with the wino agent's mentations as a focal guide, Joe had no difficulty in picking out their two watchers. These two were also nondescript in appearance. They waited patiently, as might well domesticated husbands waiting for wives, without either calling attention to themselves, or avoiding it.

Joe's lips twitched in a smile, and he took advantage of their natural wish to relieve their boredom. The one with the newspaper signaled the other with his eyes that a conference was necessary. Aimlessly, they drifted together near the entrance to the depot. One followed the other out the door, and together they walked up the street toward a restaurant.

With no surprise at all, they joined their fellow agent in the wino disguise, and the three of them sat discussing their quarry, speculating on who was to contact the professors, and when the trail might lead to Bossy. The wino agent had

recovered his feeling of well-being with astonishing rapidity, concluded he had just been momentarily chilled. He didn't bother to mention why they had found him there, and it did not occur to them to ask.

For a full half hour, long after he had got the two professors and Bossy safely away from the depot, Joe kept them in the mental framework of considering their quiet discussion there at the restaurant counter a perfectly normal part of their duties.

Then, since Joe was not above a certain sense of humor, he allowed it to occur to each of them, simultaneously, that they had wandered away and left their quarry unobserved. They looked at one another, suddenly wild eyed with consternation, and sprang away from the counter as if it had burned them.

They ran pell-mell down the street to the depot. They searched the place from cellar to roof. Throwing aside all precautions, they questioned everyone. No one remembered having noticed the two men at all.

They drew together out near the loading docks and began to rationalize and justify their behavior after they had realized the futility of trying to fix the blame each on the others. They were well experienced in devising stories which would convince judge and jury, but their superior had come up through the ranks and would not be so gullible.

Their attempts to account for their decisions and actions grew marvelously ingenious, didactic, logical. Their story began to approach the infallibility of conclusions found in scientific textbooks.

The simple and factual explanation of what had happened was completely outside the potential of their real world framework. And had anyone suggested it, they would have considered him mad.

II.

The Deluxe Hotel, in the heart of skid row, tried to live up to its name, by running wooden partitions breast-high between the cubicles before they finished off to the ceiling with the usual chicken wire. It was both a sop to a higher standard of modesty, and slightly more discouraging to pilfering. They changed the sheets on cots between guests, as required by the Board of Health, with a little less than the customary reluctance; but there was no difference at all in the ever present smell of vermin repellant.

Jonathan Billings sat on the edge of his cot with his head in his hands, his elbows propped on bony knees—a tired old man shorn of dignity, sureness, confidence; completely at a loss in these strange surroundings.

He looked over at his companion, Duane Hoskins, formerly Professor of Cybernetics at Hoxworth, who now sat in much the same position on his own cot, and reflected with astonishment that there was nothing in their outward appearance to distinguish them from other bums, winos and bos who lived in this section of San Francisco. Or, how did Joe express it: Men who were on the short line.

"Three days is a long wait," Billings murmured softly, conscious that anything louder could be overheard. "I wish Joe would get things resolved."

Hoskins looked up from his own reflections, his face a study in puzzlement and growing resolution.

"I've been thinking, Dr. Billings," he said obliquely. It was characteristic of the two men, even in these surroundings, that they would maintain university protocol and formality. "I've been thinking that we are a pair of fools. What are we running from? Why are we—" He broke off the sentence, but his eyes swept the small cubicle which contained their two cots and a small stand, and indicated by his expression he meant the flop house itself, skid row, San Francisco.

"We are under Federal indictment, you know, doctor," Billings reminded him austerely.

"All right!" Hoskins exploded, without realizing the loudness of his voice.

"Break it off, you two!" a voice grumbled thickly from beyond the partition. "Either talk loud enough so I can hear, or be quiet so I can sleep."

Both men turned and looked at the partition resentfully, and then at one another warningly.

"All right," Hoskins repeated, and kept his voice to little more than a whisper. "So we're under indictment. But running and hiding like this makes it worse, not better. We didn't do anything wrong. Our conscience is clear. The thing for us to do is face it, get it cleared up. I can't understand why we bolted in a panic, like crazed animals in a burning stable."

He paused, reflected, and added an emphasis significantly.

"There's a great deal about this I do not understand." He looked at Billings questioningly, almost a challenge.

Billings looked back at him over his glasses. He was tempted now to tell Hoskins that Joe was a telepath; that Joe knew what he was doing; that if he, himself, had paid sufficient attention to Joe in the past things might be different now. Back at the university he had had no difficulty in keeping Joe's secret. There he had been in his own element, and ethical silence was natural. But now things had changed.

He lifted his hands from his knees and massaged the knuckles of one in the palm of the other. He opened his

mouth, to speak, and closed it again. Even now, needing the cooperation and comprehension from Hoskins as he did, he could not break confidence. He said nothing.

"Perhaps there's something to the old wheeze about absent-minded professors, doctor," Hoskins attempted a wan smile. "We do tend to get wrapped up in our own work, lose touch with what the layman calls reality. But these weeks of running, hiding—and now this. I ask myself why?"

He paused, searching for a comparison.

"It's like an amateur play, where the actors are doing and saying completely unnatural things; where a bad director is shoving the cast into completely false situations. I'm one of those actors who suddenly realizes just how false the whole position is, how impossible it is to maintain it. Or—I'm that absent-minded professor who comes out of his woolgathering long enough to realize he isn't lame at all. He just has one foot in the gutter." He grinned wryly at the unexpected aptness of his metaphor.

"Conceivably, doctor," Billings remonstrated in a whisper, and did not realize the incongruity of his concept forms in these surroundings, "your new apperception of reality may be as untenable as the one you wish to avoid." Then a broken, almost sobbing, sigh escaped him, inadvertently. "There is nothing in the world so terrible as a mob of enraged human beings," he murmured.

He quickly lowered his eyes to his knees again, to conceal the pain in them, to conceal his broken faith in the innate goodness of man, the profound despair of realization that reason might not after all triumph over ignorance.

"Perhaps," he murmured aloud, "to believe in the inevitable triumph of rationality might, in itself, be no more than another expression of those same superstitions which we deplore in the ignorant. It is apparently an occupational disease, perhaps a fatal one, for the scientist to be too sanguine about eventual rule by reason. There is so little evidence—"

An impatient creaking of cot springs in the next room broke him off, and kept Hoskins from answering. Both men became silent, and stared down at the cold linoleum on the floor. Simultaneously, and along parallel lines, their thoughts went back over the events of the last year or two.

First there had been orders from Washington, transmitted, as usual, through the Resident Investigator. The orders were to construct a servomechanism, along the principles of the guided missile, which would prevent one plane from crashing into another, or crashing into a mountainside, to land it always safely, uncontrolled throughout by human pilot or ground crew. A servomechanism, in short, which could forsee the outcome of any probability pattern and take action to alter that pattern when necessary.

Apparently the phrases had been tacked on, one after another, by the bright boys there in Washington, without any realization of what they were asking. There was some dim realization that this might be a psychological problem, so Billings had been designated to head the project. The penalty as usual, for failure was a public whipping by investigation, and imprisonment for contempt if he answered back.

And something strange had happened. It was as if the pressure of human originality, stultified for forty years through opinion control, had burst out of bonds.

Bossy, nicknamed from the machine's faint resemblance to the head of a cow became more than an ordinary servomechanism.

The fever of original thinking spread beyond the departments of Hoxworth. The suppressed hunger to think was like an epidemic. Every academic institution, even some industrial laboratories, caught the fire of enthusiasm, contributed to the work. It was as if the scientists were resolved Bossy would be empowered to think in areas where they were forbidden to go. It was as if they felt secure in their obvious defense.

"But this is only a machine," they would say. "It cannot be held morally responsible for arriving at the only logical answers possible; even though such answers do not support your political bias. Logical rationality is neither subversive nor nonsubversive. It is simply a statement of fact. You may destroy the machine, but your verbal public whippings and pillories cannot incurably damage its psyche. It is only a machine."

Consciously, and subconsciously, Bossy was the answer of science to the stultification of opinion control.

The news of what Bossy had become leaked out to the public. There was enough truth in the misinterpretations to disturb the public with profound unrest. Bossy could take over any job and do it better than a man. Bossy could replace even management and boards of directors. Bossy's decisions would be accurate, her judgment unclouded by personal tensions.

Bossy could tell right from wrong!

It was perhaps misinterpretation of this last faculty which shook man off the narrow ledge of reason, and sent him plunging into the depths of blind, superstitious fear. Certainly it was the hook used by the rabble rousers, whose monopoly of moral interpretation might be challenged.

Opinion control had answered the gauntlet of science.

In the last minutes, before the frenzied mob had broken down the doors of the university, the three last remaining men, Billings, Hoskins and Joe Carter had escaped. Later, Billings learned that Joe and Hoskins, long anticipating this move, had crated and shipped Bossy out of the area.

They had fled in panic.

They had continued to flee, sustained by some vague dream of a quiet sanctuary where they could continue work on Bossy uninterrupted. Typical of their kind, they had no concept of where this might be; or how this new sanctuary might nullify the pressures of mass reaction to their work; or how continued work, even daily living, might be financed. Their whole life had been in the ivory tower. it had never occurred either to Hoskins or Billings that there could be any other kind.

And now they were hiding out in a flop house on skid row. Even more incredible, to Hoskins, they were totally dependent for their next move on a youngster barely twenty-two years old.

"Incredible," Hoskins said aloud, in disbelief.

"I wonder when Joe will be back?" Billings asked plaintively.

Hoskins looked at him, impatiently, and didn't answer.

The two of them sat facing one another on the edges of their cots, and endured the waiting. Hoskins reached over and took another sandwich from the supply the hotel clerk had brought them at Joe's orders. Billings wondered if he might

safely make the trip down the hall to the community shower and bathe again. He smiled, ruefully, at his apparent compulsion to bathe again and again, a protest against his surroundings. He put the thought out of his mind. The fewer people who saw them, the safer they were.

Joe had told him that the word had gone out along skid row that nobody, and it meant nobody, was to talk to anybody, and it meant anybody, about Joe and those two buddies of his holed up in the Deluxe Hotel. It was a command, a group more. But there were still those with craving for a drink or a snifter of dope, always available for stoolies who might break the taboo.

Billings' self-analysis took him back to the consequences of opinion control, the same consequences which had occurred again and again throughout history. There had been many times when man had been forced to adopt the only right opinion. Each time man's forward thrust had slackened, vegetated, and died. Once, through the dark ages, the period had lasted almost a thousand years.

There was an odd peculiarity to the scientific mind. Block off an area where it may not go for speculative consideration, and immediately every line of research seems to lead into that area.

A small boy may sometimes survive for hours with no thought for the cookie jar, but forbid him to touch it and he can think of nothing else.

"Such a pity that it happened this time," Billings said, and did not realize that he was speaking aloud. "The clue was there in front of us all the time, too. Had we realized Einstein's coordinate systems were adaptable to all fields of science, not just physics, man would have gone even beyond his own dreams. Why, in the field of sociology alone—"

There was a loud, protesting creak of bedsprings through the thin wall. It was more than a man merely turning over in bed. There was the slither of hands being slid up the wooden partition. Fingers reached the top and slid through the chicken wire to grasp support. They tensed, showed strain, and there was the sliding noise of a heavier body being pulled up the wall.

The head of hair was first to show, matted and yellow grey. Eyes followed, rheumy and blinking. The shapeless red nose, and then the mouth. The mouth smiled in an expression which the face apparently thought was friendly. It was the placating, conciliatory smile of the long habitual alcoholic.

"Would you really attempt to apply pyhsical quantum laws of spacetime continua to sociology?" the mouth asked. The words were blurred; the flaccid lips had long since forgotten how to form crisp, incisive speech.

Billings and Hoskins had been watching the apparition arise, above the partition. Billings was first to recover himself. The question restored his position in the academic world.

"Unquestionably, it should be considered," he answered.

The eyes closed. The whiter lids accentuated the grime on the face. They opened again.

"I wonder now," the mouth asked, "why that possibility had never occurred to me in my reflections? Perhaps I may blame it on the times we live in. Yes, certainly worth considering."

The head began to disappear behind the partition again, then came up. The face had an eager expression this time.

"I would offer you gentlemen a nightcap—if I had one," the mouth said hopefully.

"I'm afraid we don't have any spirits either," Billings said regretfully.

The eyes regarded them, searching their expressions for truth. Apparently the face grew satisfied that they were not selfishly hoarding.

"Then you, also, are broke," the mouth said with a twist of philosophic humour. "Distressing, isn't it? But thank you, gentlemen, for a new idea. It amply repays me for this disturbance of my rest."

The head sank quickly out of sight, and this time it did not reappear. In a few minutes there were gentle snores coming through the partition, an accompaniment to the louder ones from down the hall.

"Imagine that," Hoskins whispered finally. "Imagine finding a mind like that in a place like this."

"My good Dr. Hoskins," Billings whispered back with asperity, "we're here, aren't we?"

III.

It was three o'clock in the morning when Joe checked them out of the Deluxe Hotel. He had paid for their room in advance, of course, and checking out meant no more than dropping their cubicle key at the desk. The night clerk picked it up without question, without comment, without speculation. He had seen everything in his time and had lost all curiosity about men on the short line. Guided by the grapevine command, it was easy for him not to notice that this was an old geezer, a middle-aged bum, and a young punk.

The lobby was discreetly darker than the street outside. At the door, before stepping out, Joe touched Hoskins on the elbow and spoke in a low voice.

"I'll go first. You follow a quarter of a block behind. Hang onto one another, as if you'd had too much wine, but don't overdo it."

Hoskins started to speak, and then nodded grimly.

"What about police?" Billings asked softly. "Aren't we in danger?"

Joe looked the two men over critically, and smiled.

"You look too seedy to be able to pay a fine, so the locals probably won't bother you. The Federals have had a shake-up in the last couple of days. Seems some of their men were derelict in their duty. And they're still working the better-class sections. It's too early in the normal pattern for you to have come as far down as skid row, yet. Just follow along behind me."

Out on Third Street, the wind off the harbour was chill and sharp. The fog was so heavy it was like fine rain. A few grey shadows of men wandered aimlessly up and down the sidewalk, looming up out of the fog a half block away and then disappearing again.

Joe hunched his shoulders and shuffled toward the corner of Howard Street. He waited there until he saw the two familiar figures lurching along behind. He steeled himself against the somatic effects of dejection and misery, and sampled the minds of those men still out on the street. Everything seemed to be normal. Some of the men were drunk; others, lacking the price of a flop house, were drugged with weariness and lack of sleep. A pair of cops were working the street two blocks up, routing such men out of doorways or alley corners where they were trying to sleep. But they were already beyond Joe's destination.

He waited again at the entrance to an alley, until the professors were almost

up to him. They were doing very well with their act, and when they followed him into the alley it might have been no more than the act of any normal human being seeking food from a garbage can, or hunting redeemable bottles thrown away by some more fortunate wino.

Joe stood in the darkness of the alley, waiting until they had come up to him. He made a quick survey of the minds in the vicinity and detected no evidence that any of them had been noticed. He took a key from his pocket and opened a door. He led them down some steps, cautioning them to feel their way carefully in the blackness. He took another key and opened another door at the bottom of the steps.

He led them into the even deeper blackness of a room, closed the door behind them, heard the click of the latch, and snapped on a light. After the darkness, the light dazzled all of them for a moment, and then they began to see. They were in a small and neatly furnished living room.

In front of them there stood a slight little man who stared unwinkingly at Joe. Heightened by flared up eyebrows, the eyes might have been those of an owl.

"I see you made it, kid," he said in a dry, brittle voice. He turned and called into another room, "Mabel, they're here."

The side door to the room opened, and a huge woman waddled in. Her hair had been dyed a flaring crimson, but showed a full two inches of grey at the roots. Her face appeared to be coated with varicolored enamels.

"Quick trip, son," she said approvingly. "Coffee isn't even ready yet."

"Mabel . . . Doc Carney . . . meet my friends, Professor Billings and Professor Hoskins." It never occurred to him to fumble for Mabel's last name, or that Doc Carney might have any other. It never occurred to anybody. Their identities were complete and understood.

He watched both Hoskins and Billings bow slightly in the direction of Mabel. Here, in a more familiar kind of habitation, some of their dignity came back to them, and they wore it well.

"Sa-a-ay," Mabel boomed at them in her hoarse voice, "you're people."

Joe was pleased to see a look of comprehension, orientation, come into Hoskin's eyes. Perhaps that ivory tower had not been so sheltering, after all. Naturally he had never looked in to see, since that aspect of Hoskins was none of his concern. But Billings was completely bewildered. His expression seemed to say that naturally they were people.

"The word 'people,' " Joe instructed in a dry, didactic manner, "used in this context at this ethnological stratum contains a specialized semantic content, signifying respect, approval, classifying you as superior in the humanities attitudes."

Thus translated into simple English, Billings grasped the idea quickly. He took a step forward and held out his hand.

"You're people, too," he murmured. "That is not difficult to apprehend."

"My-y," she bridled in admiration, and shook his hand up and down heartily.

"You're entirely right about that . . . er . . . professor," Doc Carney said with approval. "Mabel was a hundred-dollars-a-night girl in her day. She's real class."

"You don't say," Billings murmured, without any comprehension at all.

Mabel threw him a quick look, then flicked her glance suspiciously at Hoskins.

Hoskins gave her a broad grin, and with a wink indicated that Billings was not wise to the life. Mabel took it then as it was meant, a compliment. Joe hurried quickly, before he burst into laughter, into the adjoining kitchenette where the coffee had begun to percolate. The somatics in the room were wonderful. He hadn't needed to supplement with broadcasted reassurance at all .

"And did I understand that you were introduced as Doctor?" Billings turned toward Carney after they were all seated and asked. "What field, may I ask?"

Joe heard the question and came to the doorway with the percolator in his hand.

"Doc is an honorary title," he told Billings. "He's a carney

"I beg your pardon, Joe?" Billings asked.

"Doc Carney was a practicing psychologist," Joe explained. "A mentalist at travelling carnivals. He had an act. From the stage he told you things about yourself. I was his shill in the audience one summer while I was on vacation. That's how I got to know him. We rolled 'em in the aisles."

"Never saw anybody pick up the codes faster than Joe," Carney commented. "Tried to get him to stick with me, we'd have made barrels of money."

Mabel was in her element. It had been a long time since gentlemen had sat around in her parlour, talking in high-class voices. She sat in an elegant pose in her old red sweater, and surreptitiously glanced at a wall mirror to see if her bright orange face powder and flaming lipstick were wearing well. In a provocative gesture of old, she flicked her long jet earring back and forth at the side of her cheek with her finger, and tried to shrink her broad and shapeless thighs into something like seductiveness. With the forefinger of her other hand she scraped idly and futilely at a dirt spot on her old black skirt.

The room fell suddenly silent, and all of them welcomed the steaming cups of coffee Joe carried in on a tray. All of them sipped slowly, appreciatively. Mabel alternately straightened her little finger and tucked it in again, unable to remember which was considered the more fashionable. It had been a long time since she was a hundred-dollars-a-night girl. A very long time.

"Now to business," Joe said crisply, and set his cup down on an end table beside his chair.

Hoskins and Billings were past any stage of astonishment. It seemed quite natural to them that Mabel was their landlady; that she owned half of the property on the short line; that she had documents, letters, inscribed jewelry, and memories of former days which protected her against shakedown and blackmail.

"I could tell you plenty about these sanctimonious old geezers who tell the rest of the world how to be good," she boomed. "But I leave them alone and they're glad to leave me alone. It's the same with my tenants. As long as you boys treat me fair, pay your bills, and don't get me mixed up in your troubles, I leave you alone. I don't know what you're doing here. I don't want to know. It's none of my business. I don't pry and snoop. I don't have to. I've already seen everything."

"She means it, too," Joe said. "Mabel doesn't pretend to be respectable, you know. So she doesn't need to get her kicks out of peeking and spying and being scandalized and righteously indignant."

Mabel turned and looked at him with shrewd eyes.

"What do you know about it, son?" she asked. "You're not even dry behind the ears yet."

Joe winked at her and pulled his mouth into an expression of self-mockery.

"Why, Mabel," he said, teasing her, "you've heard about this terrible younger generation. I might even be able to tell you a few things."

She threw back her head and roared with a hearty laughter. They went back to business.

Doc Carney was to be their outside contact man, buying all their supplies for them. Hoskins and Billings wouldn't need to go outside at all. There was a big room, beyond the bedrooms to this apartment, which could be fitted into their workshop. Long ago power lines had been cut into the trunks under the street. It was never exactly mentioned, but it gradually became clear that the former tenants, who had paved the way for them, were counterfeiters.

It became apparent, also, as Joe had planned, that Mabel and Carney assumed they were also counterfeiters. Obviously Billings was the engraver, no doubt some old renegade who had once worked for the Treasury. Hoskins must be the mechanic, the handy man, the chemist. Joe was the front for the outfit. And now that Mabel and Carney had seen them all, Joe was probably the brains of the outfit, too. These other two were putting on a good show at being college teachers, but it wasn't all show. They really were out of this world, and didn't know enough to come in out of the rain.

When they began listing some of the things they needed, Carney's suspicions were confirmed, although his eyes opened wide at the list of electronic and chemical equipment they felt they might need. His expression indicated he thought these boys were really going first-class.

"You can't buy this stuff with queer money," he said at one point, coming right out into the open with his suspicions. "I can get all this stuff cheap. The boys heist it from warehouses, or highjack it, or lift it from labs and plants. Most of this stuff is hard to dispose of, so it'll be cheap. They got no sense about what will move fast. Their fingers stick to everything. Still, you got to play fair with them. Pay them with queer, and you cut off your own nose."

"The money will be good, Carney," Joe reassured him. "This is a square deal all around."

"That's all I want to know," Carney answered with relief. "How you pass the stuff and get good money for it to pay the boys is your business."

"I haven't said I was going to pass any queer," Joe reminded him.

"That's right, son," Mabel interrupted. "Never tell anything."

"But just how will we get the money?" Hoskins asked. "It will take a great deal. And we're not working on subsidy now."

"It won't take as much as you think," Joe said. "We're almost through. Just a few additions and conversions to be made now. I've been playing the races for it. I've got a system."

Carney looked at him with admiration. The kid thought of everything. That would answer any questions about where the money came from. It was an old blind, but a good one. He threw back his head and laughed.

Mabel thought Joe was kidding them, and laughed along with Carney. Anybody knows that systems are for the lambs who want to be fleeced. Hoskins considered that Joe had rebuked him for discussing it in front of strangers. He laughed to cover his *faux pas*.

"I am not certain that one can be assured of winning on such wagers," Billings said doubtfully, seriously.

They all laughed then.

"Don't worry about it," Joe said. "Any of you. That's my job."

"Just keep your nose clean, son," Mabel boomed.

Everyone sat and admired everyone else. Everyone was quite certain he understood everyone else. And Joe knew none of them understood anything at all.

For he had not yet told Billings and Hoskins what he intended to do with Bossy. Their realization had not yet come that he had been using them this last year; using the facilities of Hoxworth; the facilities of all the institutions who had helped on project Bossy; using the subsidies from Washington. He had been using them selfishly, with determination, with practical application of psychology to serve his own purpose.

He had no sense of guilt about this. It was certainly normal and well-established practice for individuals to divert tax monies to their own advancement. It was one of the many survivals of savage custom working in modern society. The tribesmen paid their tithes to the chieftains, the elders, the witchdoctors—as always.

And, without even attempting to rationalize it into the end justifying the means, it was an obvious bargain for both sides. For the human race there was now a thinking machine, one which could use discrimination and judgment, and act. When the troglodytes got over their superstitious fear of flame, they would find fire quite useful.

And for him, it was deliverance.

For him the long loneliness would be ended. He was already quite clear on how the psychosomatic therapy knowledge of Billings could be incorporated in the machine, how the machine could interact with a human being to get down to the bedrock of every fixation, inhibition, repression of a person. How these would be supplanted with orderly rationalization.

From the machine, in due course, a man or a woman would emerge—a real man or woman; not the twisted, warped, pitiful deformity which passes as human.

And, if his reasoning were correct—another telepath.

IV.

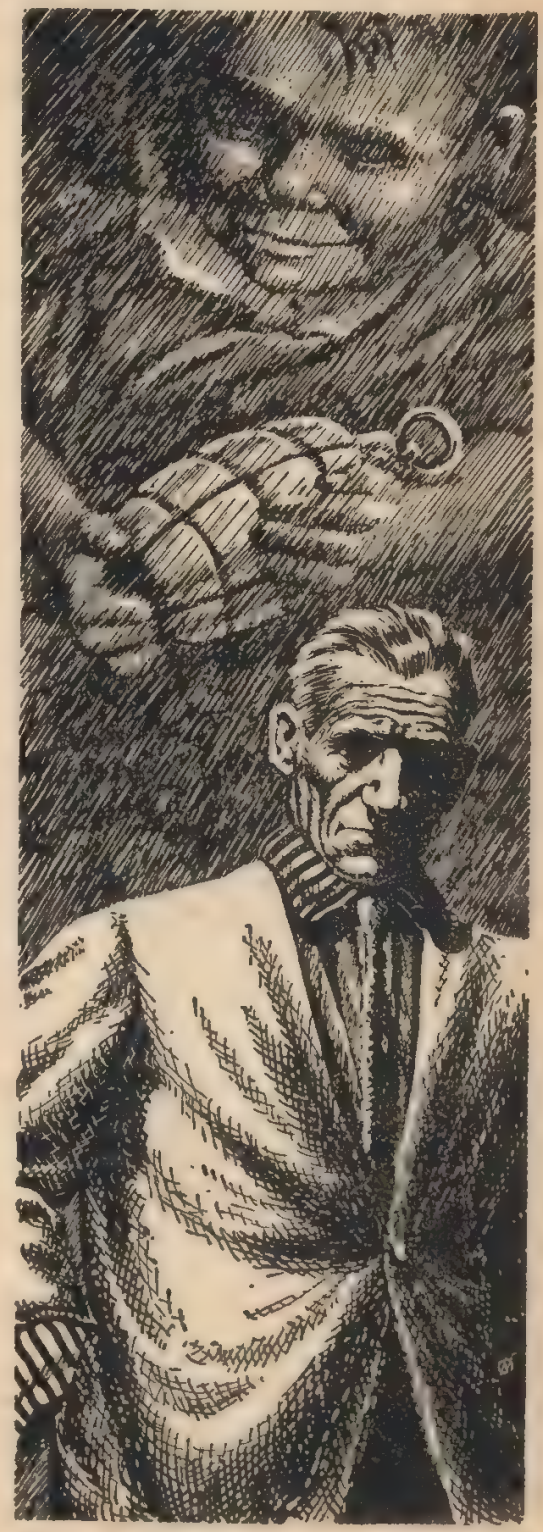
For a week, almost day and night, Duane Hoskins worked on the reassembly of Bossy. Now that the parts were in his hands again, and he had a place to work undisturbed, he pushed conflict with his circumstances into the background and gave all of his thought to the task of bringing Bossy back to her original state of function. He assured himself that when his job was done, then he would attempt to get a more realistic approach to his relationships with government and other people.

The reassembly took all of his thought. He started out on the task as if it were no more than a routine nuisance which he must endure, since he had been all over this ground in the first assembly. But as the sub-assemblies began to accumulate into their proper relationships again, he grew more and more excited.

Guided as he was by a rigid intellectual honesty, that one faculty which makes the scientist differ from any other calling, he found himself freely acknowledging

that Bossy was not his creation. Bossy was not even a true product of cybernetics—at least not as that science had been conceived before the start of this project.

Somewhere, somehow, they had surmounted the thin and narrow conceptions of their predecessors. Only now, with the accomplished fact before them, did he realize just how thin and self-restricting those concepts had been.



More important, and more incomprehensible, they had surmounted the sterility of opinion control. Although, in the narrow sense, his field was far from the dangerous social sciences; early in his career Hoskins had realized that no field of science is remote from the affairs of men, that there is a sociological implication inherent even in the simple act of screwing a nut on a bolt.

Of course he had never expressed this in a classroom. Outwardly he had held to the prevalent opinion that the physical scientist has no responsibility to man for what he achieves. As with all other instructors, he knew that in each class there were bound to be at least two or three students who, in preparation for careers to come, had set themselves up as the supra analysts of what was the only right opinion. These were diligent in reporting to pressure groups, or directly to Resident Investigators.

The consequence was that even the brightest of students were becoming no more than cookbook engineers. This had always been regrettably true of ninety-five per cent of engineering students. But before opinion control there had been at least five per cent whose minds were fertile enough to conceive a variant idea.

Now, for almost half a century, there had been nothing new. There was an apparent progress, of course. The cookbook engineers were still able to mix up new batches from old ingredients. There was still enough gadgetry invention to confound any

criticism. But there was no exploration of new ideas, hunting for new frontiers.

In his own field of cybernetics, he had studied the mid-century experiments with ultra high-speed computers, the automatic chess players, the visible speech mechanisms, and the like. He had discovered how close the followers of Babbage and Vannevar Bush had come to their dream of the second industrial revolution. But here, in the closing decade of the century, cybernetics was still playing mechanical games with the same concepts.

Only Bossy was different.

As he continued with the reassembly, Hoskins grew deeply troubled. At times he felt as if he were on the verge of some vast concept not quite grasped; as if he caught glimpses of an outline of a totally unknown continent where, always before, all science had assumed there were only empty seas. He cursed the sterility, the rote memorization which passed for learning. He bitterly accused his own mind of being like a wasted muscle, long unused, now incapable of a task which should be accomplished with ease.

Not that he was failing in the reassembly. Complex as it was, he remembered each step in perfect order. And, laid out before him as it was, he knew the theory and purpose of each part. What he failed to grasp was how it had been conceived in the first place.

He recalled well, in the early days of the project, the consternation, the blank incomprehension between one department of science and another. The legendary Tower of Babel was a miracle of understanding by comparison. As is to be expected when men are deeply disturbed by a sense of inadequacy, each branch of science had withdrawn into itself, become more and more esoteric, more ritualistic. As the inadequate man looks for and seizes upon differences so as to establish his superiority, so each science had moved farther from the common purpose of science—which is to know. And that was the way this project had begun, in spirit and in practice, back there at Hoxworth.

Then, suddenly, for no apparent reason, men understood one another; problems were solved; old jealousies forgotten; prejudices discarded. Everywhere in the university the departments were caught up in the spirit usually known only to a few men—the desire to go beyond apparent differences, to understand what is really meant, to regard with pitying impatience those who would still value personal ascendency over comprehension.

And, most astonishing of all, everyone took it for granted. No one seemed to have realized what had happened, much less why. He, himself, had not realized it until now; when the act of reassembling Bossy forced him into a minute review of each stage of the work. Only in its totality did it reveal its logical impossibility.

He tried to question Billings during the afternoon when they were working together installing the random synaptic selectors which would respond to sensory code patterns.

"Dr. Billings," he said carefully, "while it is apparent that no individual part of Bossy was unknown to science, even fifty years ago, the blending of the parts, and, above all, our concept of what happens in the process of thought, is new. How did we manage it? You were the head of the project. You ought to know."

He saw the same hesitancy, the same film of concealment that usually came over Billings' candid eyes blue when this topic had been discussed before back at Hoxworth.

"Probably no more than fortuitous circumstance," Billings answered evasively.

"I don't believe that, and neither do you," Hoskins stated bluntly. He pointed to the hydrogen ion concentrators, to the wave-field harmonics receptors. "These are accident?" he questioned with disbelief amounting to derision. "It was accident that the Department of Music was able to give us the clue to search activators in pattern selection? That the department of Synthetic Textiles was able to show us how to polymerize and catalyze strings of molecules into the material which became Bossy's concept storage unit?"

In nervous tension, he paced up and down the room, and puffed at his cigarette as if in agony.

"That Bossy is able to take part patterns," he continued in the same incredulous voice, "and fill in the missing pieces from probability selection through her proprioceptors? That we were able to recognize this as the treasured and mysterious process of reasoning?"

He stopped his pacing and pounded softly and slowly on the edge of the work bench with the heel of his hand.

"Above all," and now his voice was almost querulous, "it was sheer accident that we were able to understand one another, go beyond semantic differences to the real core of meaning—when, as you know, our usual pattern was a gleeful destruction of the other fellow's attempts at comprehension? Dr. Billings, I am neither a child nor a fool. I cannot accept the theory of fortuitous circumstance!"

"We did it," Billings answered shortly, and wondered why Joe had permitted this question to arise in Hoskins' mind at this time. Joe should have told him, should have cued him on what to do. This was conflict, and Bossy was not yet completely assembled. "We did it," he repeated futilely. "Isn't that the only important thing?"

Hoskins glared around the room, at the bare pinewood floor, the stained cement walls of the basement room, the harsh overhead lights, the door to their bedrooms which was the only source of fresh air.

"What am I?" he asked hoarsely. "No more than a handy man? Is that why I've placed myself in jeopardy, taken all these risks; just to hold a job as subordinate mechanic—without pay? Are we working as a team, doctor? Do we have one another's confidence; or don't we?"

"I don't know how to answer you, Duane," Billings said slowly, and Hoskins noticed that his first name had been used in their conversations

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for the first time. "I don't know why you've been permitted to think of these things."

"Permitted to think of them!" Hoskins exploded.

Billings fluttered his hands in the air, as if to ward off violence.

"You will have to ask Joe," he said weakly.

V.

The three men sat in the small living room of their basement quarters, having a late sandwich before going to bed. The somatics in the room were tense.

Hoskins pored over the schematic of the multiple feedback system alternately fretting over whether Carney would be able to find the right tube for the torque amplifier, which had been cracked in transit, and stewing over the indignity of having been referred to Joe for the answers he felt he must have.

Billings mused over the problem, given to him by Joe days before, on how automatic psychosomatic therapy mechanisms could be installed in Bossy, what the most effective electrode contact with human subjects might be, and how reverie reviews could be taken down to cellular level, as Joe had insisted they must.

Joe worked at the small desk, extending the probabilities of his system to the end of the Tanforan meet, to tailor his bets to the amount of money they would need until the next racing season. The system was imperfect in that jockeys sometimes changed their minds in the heat of the race, extended their horse when they were not supposed to, won when they were not supposed to win. Reserves had to be set aside to cover a streak of these. Still, it was the safest method of getting enough money without calling attention to himself.

The scene was much the same as it had been back at Hoxworth, when he was secretary on Project Bossy; but the circumstances, both overt and somatic were different.

He was aware that Hoskins was facing a crisis, one which had been maturing for the past two weeks, that if he let it go on, Bossy, herself, might be threatened. He could have avoided it, of course, just as he had avoided it all those months at Hoxworth. Delicately, he could have implanted the right impulses in Hoskins, so that revealment would come as no shock. But he had a sound reason for doing otherwise. Hoskins had a first-rate brain, and Joe had come to realize that blind acceptance of his extrasensory perceptions would give him no clue as to how the same gifts might be installed in Bossy. It was necessary that Hoskins fight it out on a cerebration level.

Further, he felt the same loyalty toward Hoskins that he felt toward Billings. And he wanted Hoskins to have the full benefit which Bossy could eventually give. That meant Hoskins had to grow up, wittingly, of his own volition.

At that moment Hoskins reached over to the stand beside his chair and picked up another of the sandwiches. He glanced at Joe obliquely, his curiosity almost overcoming his resentment. Joe chose this moment to look up from his own work.

"Every man surrounds his mind with a framework of screen mesh," Joe said conversationally, "composed of his prejudgments, preconceptions, of what is acceptable to him. Everything he receives must filter through it."

Hoskins glared at him impatiently, as if a precocious child, age five, had tried

to be profound about man and woman in marriage. He flared in sudden anger, and his mind formed the sentence, "What would a young punk like you know about it?" but he was too courteous to say the words.

"So it seems to you," he spoke flatly.

"So it is, doctor," Joe said, without deferment. "The first strands of the screen are strung very early. 'Don't do this! That's bad! Now that's mother's good little boy! That's nasty, shame on you! You're too little to do that alone! That's over your head, wait until you're older! Always tell mother when the children are bad to you!' On and on with things like that."

"So?" Hoskins questioned with a shrug.

"So a pattern of standards is formed. Everything is judged in relation to that pattern. The stream of commands, admonishments, casual remarks are buttressed, ingrained, and enforced with emotional impact, sometimes with physical shock treatment administered with the flat of the hand where it will do the most good."

"Then education comes along," Hoskins debated with a smile, "and tears your screen to pieces."

"In theory only," Joe said. "But not in practice. Even then everything received is modified by the screen. Oh maybe there's a hole punched here and there, and rewoven with new strands. But new strands are woven, that's the point. The filtering goes on just the same. Even if a new idea pushes against the screen with such force that it must be considered, it is usually so distorted by the time it has been 'rationalized through the screen' that it means just what the receiver wants it to mean."

"The prime purpose of education, Joe," Hoskins instructed, "is to insure an open mind, the ability to consider an idea on its own merits, to accept reality without distortion."

"You've been wondering, lately, how Bossy came into being," Joe said abruptly.

Hoskins looked at him curiously, and then over at Billings accusingly. Billings had had no right to discuss their conversation with this immature boy.

"I'm a telepath," Joe said simply.

"Nuts!" Hoskins exploded disgustedly.

Joe threw back his head and laughed freely.

"You see what I mean, doctor?" he chuckled.

"I see I've got enough problems on my hands already, without having you spring a lot of wild-hair notions on me," Hoskins snapped. Then pityingly, "Joe, I've always thought you a were diligent and fair student. I never suspected you harbored ideas about that superstitious guff. Joe! That's for the credulous, the wild-eyed! It's . . . it's beneath the notice of rational men."

"Dr. Rhine didn't think so," Joe answered.

"That's different. That was scientific research under laboratory conditions. However, it is significant that Dr. Rhine never found, nor claimed to have found, a true telepath."

"Neither have I," Joe said quietly. He kept his voice normal, not revealing the dark loneliness of lifelong solitary confinement, such as might be known by a human who was never once permitted to communicate with one of his kind.

"At best," Hoskins continued forcefully, "all he found were some phenomena

which exceeded the laws of probabilities. That might mean some trace elements, true. But it could also mean that our notions of the laws of probabilities could stand revision."

"And your screen mesh prefers the latter," Joe laughed.

Billings looked over his glasses, and cleared his throat.

"I have known about Joe," he said hesitantly, "since he was eight years old. Dr. Martin of Steiffel University wrote me. That's why I brought Joe to Hoxworth. There was sufficient evidence, Duane. I could not deny it. And . . . I, too . . . tried."

"You've been the victim of some elaborate hoax, Dr. Billings," Hoskins said harshly.

Joe looked at Hoskins, undismayed.

"Professor," he asked, "what was it Algazzali wrote about the 'fourth stage of intellectual development'?"

Instantly, like a man reciting a bit of poetry learned in high school, Hoskins quoted:

" . . . When another eye is opened by which man perceives things hidden in others . . .perceives all that will be . . . perceives things that escape the perceptions of reason—"

"You didn't know you remembered that, did you, professor?"

Hoskins shrugged.

"It means nothing," he said. "Neither the drivel nor the fact that I remembered it. A young college student absorbs a lot of such guff before he gets down to serious work. You've run across it somewhere, Joe. It was a safe assumption that I would have, also."

"But how clearly you recalled it!" Billings teased. "And after all these years, too."

"That, too, means nothing. We've shown in Bossy how a concept may lay idle, never be called into use, until the right harmonics stimulate a pattern where it is required."

Joe reached over, took a piece of paper and pencil, scribbled a note, folded it, and handed it to Billings. At that moment Hoskins started up from his chair.

"Excuse me," he murmured in a stricken voice and headed for the bath.

In a few moments he came back into the room. His eyes were watery, his cheeks pale, his nostrils drawn.

"Don't eat any more of these sandwiches," he said. "The meat must be tainted. At least in that one I got."

At Joe's motion, Billings handed the note to Hoskins. Curiously, Hoskins opened the note and read it.

"Professor Hoskins will need to vomit in less than one minute," the note said.

Hoskins crumpled the note and threw it in the wastebasket in disgust.

"That's telepathy?" he asked derisively. "Probably saw me turning green around the gills. Jumped to conclusions again."

"Even before you felt any discomfort, professor?" Joe laughed. "And how many of these conclusions do I have to jump to before the evidence will penetrate your screen."

"A great many more," Hoskins snapped. "I—"

There was a sudden urgent rap on the door.

"Another demonstration, professor," Joe said dryly, as he got up to open it.

"That'll be Carney. He'll have Mabel with him. He's very disturbed. Incidentally, he has your torque amplifier tube. And, gentlemen, he has found out who we are. This is a showdown, so let me handle it."

When he opened the door, Carney and Mabel stepped through, and Carney shut the door quickly, as if he were being pursued. The old reprobate's eyes were flashing anger. Mabel's usually generous friendliness was replaced by a mask of curiosity, wariness. Although Carney had much to say, he seemed at a loss how to begin now that he was here.

"I got the tube," he opened accusingly, obliquely. "This stuff is real hot. The Feds and local boys have passed the word along to watch for anybody buying it. They're paying big stoolie dough, too. You guys are hot, too hot!"

He turned to Joe, his voice a compound of anger and disappointment.

"You tricked me," he burst out with what was really bothering him. "I didn't know you guys was Brains. I didn't know you was them three from that eastern college the whole country is looking for."

Billings and Hoskins looked at him curiously, and then at Joe who stood easily beside the closed door and said nothing.

Carney turned to Mabel.

"I swear, Mabel," he said apologetically, "I didn't know these guys was Brains when I asked you to rent them this place. I just thought they were in a counterfeiting racket or something." Then he added bitterly, "But I guess I ought to have known. The way Joe picked up the code when he worked with me in the act. I just thought maybe he was psychic or something. I didn't know he was a Brain."

Joe glanced at Hoskins with a suppressed smile.

"See what I mean about prejudice screens, doctor?" he asked. "Now it would be all right with Carney if I were merely psychic. But to have a trained mind—that's something to arouse antagonism."

"But you're not our kind of people at all," Carney argued, his anger arising again. "You don't belong with us. And you tricked me."

Help came from an unexpected source, and without any effort from Joe.

"Who are we, Carney," Mabel asked slowly, "to point the finger at anybody?"

"But these guys are the ones who invented that machine which is gonna blow up the world, Mabel," Carney shouted. "They're the ones that thought out that thing which is gonna make slaves of all the people when it takes over the world and runs it. They built Bossy!" He cast a fearful look toward the back room.

"I'll bet it's that Bossy thing they've got in that back room, not a counterfeit press at all! These guys want to wipe humans off the face of the earth, and we're helping them!"

Both Hoskins and Billings started to protest the string of clichés picked up from yellow journalism, but Joe silenced them with a warning look. Let the boil-over run its course. You couldn't get into a man's mind with reason while it was inflamed with anger; the prejudice screen was at its very strongest then. It was the old clash of ignorance without learning and ignorance with it.

Only Mabel seemed able to surmount the conflict.

"I've always said," she commented, "that a person does what he has to do. Maybe Joe and the professors can't help being what they are—any more than you and I could help being what we are."

Joe watched her intently. He knew now that she could qualify for his intended use of Bossy, as he had suspected she might. He had been wise in choosing skid row. Only here, among those broken by accusation, could be found those unwilling to accuse. Only here, among the victims of a too narrow sense of right could be found those who were not fatuously confident of their special endowments for defining it. The same conclusion had been reached once before, two thousand years ago.

"It's not for us to say, Carney," Mabel added firmly.

She stood there, a shapeless hulk in her old red sweater and black skirt. Her swollen feet were planted far apart. The red joints of her rheumatic fingers opened and closed painfully. The mask make-up on her face, meant to conceal the age and pain lines, could not conceal her quality. Mabel was—people.

VI.

For almost a week Joe avoided everyone as much as possible, allowing the change of status to settle itself into acceptable relationships, He knew that Billings and Hoskins were having many long conversations about his psionic ability, that Hoskins was gradually rationalizing the idea that Billings had not been hoaxed after all.

"I mean," Billings said at one point in their conversations, "we must be willing to go beyond the present frontiers of physics to understand Joe's psionic traits. We must get a notch above the concept that for a thing to be scientific it must have visible wheels."

"The frontiers of physics—." The phrase appealed to Hoskins, helped him to view this dark trait with something nearer acceptance.

"I have no doubt," Billings pressed his advantage, "that the answer lies in some order of energetics not yet explored. We do have to go beyond the mere parroting of the words of Einstein's coördinate systems and think in terms of genuine practical application."

"I'm not sure I see how that can be done here," Hoskins objected.

"The eye is no more than a cellular mechanism activated by the wave field of energy we call light," Billings reasoned. "The encephalograph reveals the brain generates its own wave field of energy. Some obscure area of Joe's brain has taken a mutant leap and is activated by that wave field, so that he can perceive thought directly, as the eye perceives light. Such an area might be present in every brain, but rudimentary in the way of light sensitive cells in primitive life."

It was not the complete theory which Joe held, but it served to orient Hoskins to the idea that Joe was no more than an eugenic mutant. It brought the idea out of the areas of metaphysics into the realms of physics.

But even with such rationalization, the emotional implications of living in the presence of a telepath were too much for Hoskins to accept immediately. Man, even the most brilliant of men, is not all intellect. No man is without skeletons in his closet, those little quirks, those dark little actions and mean motives, shameful little things which he does not even reveal to his doctor, his confessor, his psychoanalyst.

Hoskins resolutely faced such things in himself, and as resolutely turned away from them. His mind refused the idea that Joe could see them clearly.

"How could you continue to respect me if you knew these things about me?"

He had not yet arrived at the knowledge that Joe would have seen thousands of carbon copies of such traits in others, would have grown up with them, accepting them from the first as being no more than normal to any human being. That in the balance scale of a man's life, achievement was even more splendid because it did gain ascendency over the furtive quirks; that man was even nobler in that, at the same time, he was so reprehensible.

Hoskins would arrive there, but it would take time.

Carney progressed in his own adjustments much more easily. His resentment changed to admiration, partly by Joe's unsuspected somatic assurances, partly through the example set by Mabel. The tenderloin stratum has an almost universal contempt for the organized hypocrisy of society. Unable to accept it, become a part of it, they are broken by it. They seldom become enough detached to see it is this very pretense of man to be better than he is which drives him to convert his pretense to reality.

Carney was delighted, after his first shock, to find that Brains sometimes find themselves in the same boat as shortline outcasts.

Somehow the word had leaked out that the two professors had been found, and lost, in the San Francisco area. The search, which had been spread over the nation, now concentrated itself in the San Francisco area. And the area was ideal for the search. Surrounded on three sides by water, San Francisco has almost the status of an island and the traffic flows are concentrated ideally for thorough search.

The newspapers and communication channels which had been regretting a lack of world crises at the moment, revived the entire issue with enthusiasm. All the lurid misconceptions were rehashed, improved upon, spun into the most sensational stories the fertile minds of reporters could conceive. The witch hunt was on in full force, and Carney kept himself busy collecting commentary. Although the danger was great, he was almost beside himself with pride that he was on the inside, that a word from him could blast the whole thing wide open. For the first time, he felt revenged upon society. It was within his power to withhold the very information society craved. And, at this point, that knowledge was sufficient satisfaction.

Half a century previously there would have been many champions rising to argue both sides of the question Bossy; many to defend the right of these professors to push the frontiers of knowledge ahead. But forty years of effective opinion control had ingrained the habit of instant agreement with official opinion, regardless of how often that official position might change sides or contradict itself.

Still, one man did have the courage to call for a calm and rational consideration of the issues.

Howard Kennedy released his editorialized interview through one of the newspapers where he owned the controlling stock shares. He cited, calmly, the historical precedents where mass reaction had been violently antagonistic to other scientific discoveries; anaesthesia, steam power, electrical power, Newton's laws of motion, Galileo's concept of the solar system, a long list which, upon analysis, was seen to contain almost every advance man had made in his long climb from savagery. He related all this to the question of Bossy, and left the

question hanging as to whether this might prove to be another such instance of misguided opposition.

It was a daring thing to do, for it ran counter to popular opinion. Apparently he felt his millions, his position of power, his well popularized philanthropies, his liberal attitudes toward labor, would protect him.

Billings and Hoskins found the article in divergent rays of hope. Billings saw in it the possibility that man might once again capture the rational point of view. Hoskins, fretting under the conditions of the dark basement, the lack of competent assistants, the pressure of knowing he was hunted by government, saw a protector, a subsidizer, a return to the respectability of an ivory tower.

Joe, too, got a lift out of the article. The work on Bossy was almost finished. Billings had spent the necessary hours feeding the concepts of psychosomatics into Bossy's storage unit. Bossy had found the concepts consistent with the carefully screened factual information which had been fed into her at Hoxworth. She had not thrown out psychosomatics as being a tissue of unsupported theory. Her acceptance was all the more impressive because she had refused most of the theoretical structures of orthodox psychology on the grounds that such structures had little or no relation to observable data.

Joe had no intention of keeping Bossy to himself once he had accomplished his aim. He, too, would need someone with courage and influence, such as Howard Kennedy. But not so naïve as the two professors, he resolved to find out what went on in Kennedy's mind before they responded to Kennedy's obvious bid for their confidence. The man did not take the risk of public boycott simply to speak his piece. His motive was obviously to make contact. Beyond that, Joe could not go, not until he could get close to the man, see him, obtain some object which Kennedy had handled, some focalizing channel. It was one of Joe's limitations on his ability that he could not use it in the way some of the totally untalented normals imagined the trait would work.

But of all the adjustments, that of Mabel was most important. And when Billings told him that there was nothing further to be done with the therapy mechanisms of Bossy until that already installed could br tested and adjusted, Joe knew it was time to talk with Mabel.

There literally wasn't anyone else qualified. Hoskins was needed for his understanding of the mechanical principles. Billings must work in tandem with Bossy, man and machine coördinating to the utmost in the therapy while Bossy learned it. Aside from the fact that Joe was their only protection against the outer world, his psionic ability was too valuable to risk as a test case. Carney was openly coöperative, but Joe knew there was a hard core of hidden antagonism and suspicion. Further, Carney was quite satisfied with himself as he was, and no system of psychotherapy can make more than a temporary indentation against a basic unwillingness to change.

That left only Mabel. Mabel was obvious for an overt reason. She suffered painfully from a complex of rheumatism and arthritis, aggravated by fat. If Bossy was to prove effective at all, improvements in these would be most observable. At least these were the arguments Joe used to Billings and Hoskins. His plans went far deeper.

He went to see Mabel in her apartment on the floor above them.

She received him matter-of-factly, without question, without apology for some fancied untidiness of her apartment. Of the long list she might have been

justified in having, Mabel retained only one small vanity, and that a harmless one. Mabel had never been a respectable woman.

As he seated himself in her best chair, Joe smiled inwardly, and tenderly, at her little vanity. Even in this, she was intensely human, for she chose to be vain on a point where there was no justification for it. Her mind was so simple and direct, her honesty was too innate, she lacked the hard-eyed viciousness which comes from forcing the psyche into deformities unnatural to it. No, even if she had tried, Mabel lacked the basic characteristics which would have qualified for her respectability.

Not that she lacked inner conflicts. Her complex of arthritis and her fat were sufficient evidence that she had not been free from these.

Even her considerable wealth was not a result of calculated avarice, but was the accidental result of an odd whimsy. In her younger days, some of the important men, finding in her qualities they could not find at home, seemed to receive some defiant pleasure out of freely giving her the things which their wives schemed and trapped and blustered to gain. In that small boy mischievousness of males, they built up a solid fortune for her in a mood of perverse gratitude.

Ordinarily it is only the blackmailers and shakedown artists of the police who grow rich from her profession, but as the influence of her clientele grew her numerous arrests ceased, and she no longer found it necessary to turn over all surplus monies as the price of being let alone.

Instantaneously, her life flashed through Joe's mind as he settled back in his chair.

"We need your help, Mabel," he said without hedging on the purpose of his visit.

"In what way, son?" she asked, and her booming voice was quieter than usual.

He told her, briefly, the facts about Bossy, how they had come to build the machine, some of the things they expected from it. She made only one comment.

"It ain't the first time the newspapers have got things all twisted up."

He went on then to tell her how they hoped to make Bossy into a machine which would cure the ailments of man, such as her arthritis. Billings was a genuine medical doctor, and if she paid any attention at all she would know he had a world-wide reputation.

Mabel nodded that she did know. She asked the obvious question.

"Why could a machine do things a doctor couldn't?"

"Doctors are human," Joe answered, "and, therefore, limited. The secret of any psychotherapy is that the doctor should be less twisted than the patient. This is seldom possible. True, he may be twisted in some other way, but if he simply substitutes one twist for another he has gained nothing. The greatest care was used, when Bossy was being educated, to feed in absolutely proved and undeniable fact. Bossy did her own interpreting. She rejected unfounded opinion, or prejudice built on false premises. She is more capable of unbiased therapy than any man could be."

"I don't think I understand what you're talking about, Joe," Mabel said frankly.

He developed for her the basics of psychosomatic therapy. To bring it into her own experience, he recalled how her stomach would be upset if she tried to eat when she was acutely worried.

"The cell," he said, "is like the stomach. It refuses to function properly when such things as repressions, inhibitions, suppressions and the like affect it. Before long it gets twisted out of its healthy pattern into an unhealthy one. The idea of all the psychotherapies is to lift these suppressors so that the human can function again. Most of the psychologists work with some mysterious thing they call mind. The psychosomatic men work directly with the body cells. Not only in the brain but all over the body, each cell seems to have a mind and memory of its own. Each one is capable of getting its own twists of inhibitions and repressions. The idea is to go clear down to the cellular level and take the load off of each cell so it can stretch and grow and function again."

"Like being in a strait jacket and getting out," Mabel commented. "I got me a general idea, son. I guess, being ignorant, that's all I can hope for."

"We don't know how Bossy is going to work," Joe told her frankly. "I don't see how it can hurt you. The worst that can happen is that you won't get cured. And, of course, you won't get cured if you hang on to the ideas which caused the trouble. That's the toughest part, Mabel, to be willing to admit that you might not know what is right and what is wrong."

She threw back her head and laughed her free, booming laughter.

"Son," she said heartily, "I never did know that."

"You might be changed—a lot," he warned her, "You might not want to go on living here as you do now. You might . . . anything might happen. It's a chance you would have to be willing to take. Nobody has ever had a look at reality except through smoked glasses. We haven't got any idea of what it's really like without them. You'd be the first."

She looked down at her broad thighs, her old black skirt. She lifted her wrinkled hand with its enlarged knuckles.

"What good am I, like this?" she asked.

"I don't know for sure, Mabel," Joe said simply, "but I think you'll be giving a lot to mankind."

VII.

It was not to be expected that the psychosomatic therapy would go smoothly. Carney greeted the announcement that Mabel would undergo the test with flatfooted opposition. His suspicion and resentment came close to the surface and showed itself in alternating sulks, in his forbidding Mabel to have anything to do with Bossy, and then in actual threats to do his plain civic duty and turn them all in to the Feds.

He seemed determined to demonstrate the old truism again: that the only enemy man has is man. The universe does not care whether man unlocks its secrets or leaves them closed. Water does not care whether man bathes in it or drowns in it; whether it waters his fields or washes them away. If man masters its laws and utilizes his knowledge, water becomes a force in his favor. But enemy or servant, water does not care.

Of all the forces, only man seems determined that man shall not master the universe.

Carney paid lip service only to the boon of health which Bossy might bring to Mabel, and to all mankind. He could react only that Mabel had deserted him, had gone over to these men from the other side of the tracks. It was a bitter realization that his long friendship with her counted for so little.

More than knowledge or enlightenment or understanding, man values his ascendency over something or someone. The fate of mankind is of little consequence to him if he must lose his command in the process. Carney felt alone and deserted. It took a great deal of somatic comforting from Joe, and Mabel's stern commands for him to mind his own business, to settle him down.

The second hitch came from Bossy.

There had been a considerable argument from Hoskins that inasmuch as the hunt for them had concentrated in San Francisco, and discovery was inevitable, their best course was to initiate contact with the government, turn themselves in and hope for the best. Or as an alternative, they should make contact with Howard Kennedy, whose interview had been so liberal, and let that industrialist negotiate for them. Joe had countered these arguments with the fact that the public was still bitterly fanatic on the subject of Bossy, and that government would not dare go against the will of the people and their blood thirst.

He pointed out, however, that if they could demonstrate, with an accomplished fact, Bossy was a master healer, then Kennedy would have something to work with to make the public change its mind about Bossy. Hoskins agreed, reluctantly.

Almost day and night for the past week, Billings had fed his lifetime of knowledge into Bossy on every facet of psychosomatic therapy. And his knowledge represented the accumulated knowledge of the world. It was, therefore, a bitter disappointment that their first question to Bossy for an estimate of time required for the therapy on Mabel should cause an instant flashback of an unwanted answer.

"Insufficient data."

It was the old familiar phrase which, even back at Hoxworth, they sometimes

viewed with impatience. A human being is seldom bothered with insufficient data; often the less he has the more willing he is to give a firm opinion; and man prefers an answer, even a wrong one, to the requirement that he dig deeper and find out the facts.

Here, under the pressure of time, knowing they might be discovered any day, Bossy's bland reply, flashed on her screen, made them sick at heart. Yet, without even a survey of the problem, what else could they expect?

The problem had not been Mabel, herself. She had been more than co-operative. In view of the situation, Billings had decided to make the therapy continuous, and Mabel had willingly arranged her affairs with her attorney for a ten-day absence. As willingly, she had fitted herself into the network of electrodes and lay on the couch with complete confidence. Her last words, before Billings began to induce the hypnosis, were to Carney who had watched the preparations with hostile eyes.

"Don't be an old fool," she said, "give me a chance to get well again."

For the first four hours Billings, in tandem with Bossy, played her memories back and forth, trying to uncover the central tensions which were the source of her troubles. At the end of the fourth hour, while she was in a rambling, repetitious incident of her childhood, Billings again put the question to Bossy for a time estimate.

"Insufficient data," Bossy flashed back again.

"What data do you need?" Hoskins snapped at Bossy irritably.

"A complete survey of every cell memory to determine the quantum of repressors." Bossy flashed.

Joe, who had been hovering in the background, stepped forward.

"Based on techniques now in use," he asked, "how long would that take?"

"Insufficient data," Bossy's screen said.

"What do you need to get the data?"

"Cessation of interference," Bossy said. "By verbal methods now used, a survey would take years, or never be accomplished. The past failure of psychosomatic therapy is not in theory but in technique. A human mind is too slow, reactions are too gross. The best the human can accomplish is a few obvious snarls."

"If left alone, how would you accomplish it?" Billings asked curiously.

"It is simple," Bossy said, "for me to use the principles of the electroencephalogram. I would run all combinations of my entire storage unit against the patient. Any disturbance to the alpharhythms would indicate the source of a tension in the patient—on the order of the lie-detector principle. All such tensions could be released by replacing fallacy with understanding."

"How long would that take?" Hoskins asked.

"Insufficient data," Bossy answered.

"It makes sense, though," Billings said. "We've always known that time was our greatest enemy; that even in months we could only uncover a few of the most obvious. Bossy can operate on a thousands per second review of her storage units."

"What would be the effect of the tension release?" Joe asked Bossy.

"When the repressors are removed from the cells," Bossy answered, "they can again function normally, restoring themselves."

"Which would mean that health is restored, obviously," Billings said. "Any objections to Bossy taking over, gentlemen?"

"You're the doctor," Hoskins said.

And it was not until a week later, a week of constant watching, intravenous feeding, physical body care, while Mabel lay on the couch in an apparent coma, that they saw any change.

It was on the morning of the seventh day, after Hoskins had spent his vigil through the night sitting beside Mabel, that they saw how startling a change had occurred. It was as if accumulated releases were, all at once, showing their effect.

The puffiness was disappearing from her cheeks, the deep pouches under her eyes were less swollen, the roll of fat around her neck had shrunk. Slowly, like a face emerging from a sculptor's shapeless blob of clay, there was another Mabel—a younger Mabel.

It was more than a skin health and tautness, than the relaxation of rest, than the disappearance of wrinkles, the reduction of swelling in the joints.

The three men stood looking down at her recumbent form on the couch. They stared at her with wide, incredulous eyes. Mabel was growing young again!

The faint hum of Bossy, working at top level speed, buzzed in their ears.

TO BE CONTINUED

THE ANALYTICAL LABORATORY

Mr. James Blish will be pleased to note that you gentlemen, the readers, have handed him an extra bonus—as will also Mr. J. T. M'Intosh. Your votes in the lab have a most real meaning to the authors—and to me. We need the information the trends of those votes give us!

October 1954 Issue:

Place	*Story*	*Author*	*Points*
1.	At Death's End	James Blish	2.18
2.	Bias	J. T. M'Intosh	3.00
3.	Of Course	Chad Oliver	3.31
4.	Earthman's Burden	Moton Klass	3.51
5.	Weak Spot	Eric Frank Russell	4.31

THE EDITOR

WELCOME, STRANGERS!

***The human** met the foggish being on a planet alien to both. The alien had instantaneous, unlimited transportation—but it didn't get them anywhere at all. It could cross a galaxy, but not an official mind!*

By H. B. FYFE

Illustrated by Orban

THE monster considered Radigan with what may have been an expression. If so, it was undoubtedly an expression comparable to a humanoid sneer. The Terran, peering through the light filters of his space helmet, could not yet decide.

Having only a few seconds before tumbled into an unsuspected pit in the narrow cave he had been exploring, Radigan was still engaged in gathering his wits. The sudden brightness about him which had caused the filters to flip down before his eyes automatically only

deepened his confusion. Any sort of intelligent life was the last thing he expected to stumble across in the bleak, eroded hills of this little planet of Procyon.

"Can you understand me, Terran?" inquired the monster, as the light dimmed somewhat.

Though the tone was level and only blurrily expressive, Radigan sensed an undercurrent of resigned disgust. From his position on hands and knees amid the rubble of his fall, he stared back searchingly.

The thing looked as if it would be taller than a man if it rose on its four multi-jointed legs. In general build, it suggested a burly, gray toad with an impatient disposition and a disproportionately small, round head. Upon the latter grew a bristling, reddish mat which seemed to have been brushed away with some care from what must be the creature's "face."

The eyes were what bothered the spaceman most. A trio set in a shallow, down-pointing triangle, they were large, opaquely black, and constantly flickering with short, nervous motions. Radigan felt as if they could X-ray him. In hue, they were blacker than the creature's gleaming harness and tunic.

He shook his head to clear it of an almost hypnotic haziness.

It's not the eyes, he tried to assure himself. *Just the shock of the fall. Wonder if I broke anything?*

Inside the spacesuit he wore on the thin-aired planet more for comfort than need, it was difficult to be sure of possible sprains and bruises, but he decided that his body still functioned without noticeable damage.

"Yes . . . I can understand you," he answered belatedly, still feeling that the whole incident might be unreal.

A fleeting memory of someone telling an old joke nudged at the fringes of his mind: " . . . Figured it couldn't be a real Venusian mud-snake, 'cause if it was, I'da been scared spitless—an' then I noticed my knees *was* rattlin' inside my spacesuit like drumsticks, so I turned around an'—"

"You're . . . you *are* real, aren't you!" Radigan conceded before the monster could speak again.

The thing continued to scan him in triplicate.

"In the sense of actually existing in the same time and approximately the same place as yourself," it replied, "yes. That is to say, you are really within my force cyst."

It scanned Radigan further, and as if to make matters perfectly clear, added, "In other expressions, I am not to you a projected image, nor do I exist merely in your thinking organ. I live and move, as you should be able to observe, by the amount of light vibrations I have attuned the field to produce. Enough, I think, to satisfy your method of perception?"

Radigan thought about that as he slowly rolled sidewards to his haunches and braced himself with one gauntleted hand resting on the curving bottom of the hole he shared with the monster. The surface felt hard and slick, although it flickered with vari-colored pinpoints of light.

"Yes," he admitted, "I can see you fine. What are you?"

"You may call me Rygeef. My home is on the planet Khonyl, of which you probably have not heard. In purpose, I compare to yourself, though traveling by somewhat different means. You are a . . . what is the term in your mind? . . . a Terran?"

Radigan glared.

"Do not be annoyed," advised the monster. "Of course, I did not intend to pry. I believed you were projecting to me. Many races do communicate that way, you know. How else should I manage even so little of your speech code?"

"How did I get here?" demanded Radigan aloud, seeking with all his mental might to obscure the half-formed thought of the gun at his hip. "Now that I look up, the hole I fell through seems to be closed up."

"That may require some explaining to you," mused Rygeef.

It shifted its grayish bulk slightly. The roving eyes relieved Radigan's person of their almost hypnotic scrutiny, appearing to focus upon something beyond the fluorescing wall of force. The Terran seized the respite to examine his surroundings in more detail.

He estimated the cell-like chamber to be ten feet or less across. His back was against one side while Rygeef squatted bulkily on the up-curving slope opposite. Now that Radigan had time to look more closely, he noticed a black cube with rounded corners beside the monster's right legs. One of the creature's members, in fact, was in position to manipulate the multitude of tiny studs projecting from one face of the cube. The Terran concluded that whatever caused the flickering light was controlled from the black cube.

"I think," said the monster, " that there are among your kind such as make it their affair to find out things?"

Radigan decided that the tone could be construed as a question.

"Find out things?" he repeated. "You mean researchers? Scientists? Or space explorers, like me?"

"Yes. I perceived a few moments ago a thought of exploring a cave on a strange planet, just as I opened a slot in the force cyst to observe. You and the thought came through together, to my surprise."

"To mine, too!" muttered Radigan.

"Uh . . . zzzzz . . . yes. Like you, I am of those who explore. I thought myself in the nearness of a certain star, but my estimation was in a small degree mistaken. I returned to normal space in coincidence with one of the planets, and the thin sheet of force through which I observe did not exclude your body."

Radigan pursed his lips in a soundless whistle.

"You mean," he said, "that I just happened to be at the right spot when you let down the barrier a bit?"

"A curiosity," agreed the monster. "But then, most accidents are curious. If I strike a planet, is it more remarkable that I strike a being on that planet?"

"Well . . . how would I know?" retorted Radigan, not, he thought, unreasonably.

He wondered about the means of travel that could be so compact, and operate with no apparent provision for storage or equipment space. Possibly, he told himself, this Rygeef did not require frequent food or drink. Perhaps it did not even breathe.

"You seem to be thinking of me as if I am a freak!" declared the monster.

The Terran tried frantically to scramble his thoughts.

"I didn't mean it that way at all!" he protested. "I was just wondering how fast and how far you can go in this thing."

"How fast? Almost instantly. I see I should say 'instantaneously.' Like the speed of thought. As to how far, I could not answer. The device is not to us long known. I am an explorer, an experiment."

"Oh," said Radigan. "Say, my friends would be interested in meeting you! How about coming back to my ship? Can you bring your . . . your force cyst along?"

"It would be easier to let it take me," replied Rygeef, "if I could spare time to go."

"If you could—What do you mean? What's the rush?"

"To begin with, I must slide out of here and return to normal space at an empty position, since I suspect you will be unable to supply me with spectrum data and other information of this star, that I could identify my location."

"Back at the ship—" began Radigan uneasily.

"No, no. Out of memory, or I can not wait. You can?"

"We . . . we call it Procyon," stammered Radigan, realizing that he sounded a perfect moron. "It's . . . it's very bright. Look here—what about *me* if you have to beat it? What happens?"

The monster's three jet eyes scanned him curiously before he answered.

"I am unable to conclude," Rygeef answered. "If there has been no shift of position since you entered the force cyst, you will find yourself in the cave as before."

"And if things shifted a little?"

"Possibly a severe explosion when you return to normal space already used by the rock of the planet. Of course, if the shift is far enough to move us entirely outside the planet and its atmosphere—"

The somewhat droning voice faded to the background of Radigan's attention.

It sure takes my explosion calmly, thought the Terran. *One thing's sure—I better do something quick, before it gets set to toss me out, or I'll never see Terra again. I won't even—*

Abandoning thought to an instinct for brute action, Radigan launched himself from his crouch at the bulky gray being opposite him. His left hand darted out in a desperate swipe at the control cube.

"Be careful!" bawled Rygeef, raising its voice to a harsh rasp.

It reared up to meet Radigan's assault, flicking one of its many-jointed front legs at the Terran's head. The blow smacked like a whip across the man's hastily raised forearm, but Radigan was protected by his spacesuit. He thudded into the monster, causing a tremendous *whoosh* which revealed that Rygeef did, indeed, breathe—if nothing else.

Skidding off the curving barrier, they separated. Radigan felt himself falling, and twisted to his left to grab at the cube. The only thing in his mind was to save himself a slim chance of getting home alive.

He backhanded a scrabbling, three-digited limb that groped over his shoulder.

"I don't care about being careful!" he snarled. "You be careful—I figure to get back to Terra in one piece!"

He felt the weight of the cube through the thickness of his gauntlet and clutched it tightly.

Radigan's stomach seemed to drop out for an instant. Such a wave of dizziness overwhelmed him that he suspected the monster of having landed a crushing rabbit punch below the heavy rim of his helmet mounting.

Even as he was wondering how he came to be sprawled on his hands and knees, he became aware of an indefinable change in the flickering of the walls.

"Now you have ruined us!" buzzed Rygeef accusingly. "Give the cube to me before you more damage do!"

Radigan glanced at the object clenched in his left gauntlet. He relaxed the fingers which held down several of the tiny studs.

"Cease your attempts!" ordered the monster. "The jump is accomplished. I hope you have memory of where you thought in the instant of shift."

"Where I thought—?"

"How else could one control such a far-ranging method of shifting location outside normal space?" demanded Rygeef. Its voice was rising angrily to a volume Radigan had not supposed it capable of achieving. "Now give me the control, you ignorant savage, before you cause the death of us!"

"Just a minute!" Radigan held up his hand, then relaxed enough to sit down. "The first thing, if we really moved, is to find out where. Right? Well, you tell me how, and I'll do it. That way, we can both stay calm, eh?"

Rygeef spluttered and rumbled through an astonishing series of choking noises. Three oval sacs about the circumference of its round head puffed out to an alarming degree, suggesting more than ever the proportions of a gigantic toad. In the end, the monster yielded to the Terran's obvious determination. Folding its legs, it squatted in its old place.

"Take one of your tentacle ends—a sensitive one if you possess such—and place it where I tell you," Rygeef directed. "That one will do, if you are at all skilled with it. Move it along the last row of studs . . . there! No, back one . . . that is correct. Now, when I tell you, press the stud gently . . . very gently . . . and at the same time think of a transparency in the shield. Think a narrow slit . . . not completely open . . . just transparent."

"O.K. . . . I think," said Radigan.

"Press!"

The man depressed the stud very slightly. He concentrated upon the idea of a slot in the coruscating wall surrounding him, though not quite convinced of the sincerity of his guide.

Almost immediately, however, a stripe ten or twelve inches wide spread from top to bottom of the enclosure. It was as clear as glass, and Radigan caught a glimpse of something blue-green beyond. He stood up to press the curving front of his space helmet against the peephole.

"That's Terra out there!" he gasped.

"Good! Excellent!" congratulated the monster sourly. "At least one of us knows where we are. That is something to cause gratitude in one."

Radigan turned to face the other, conscious of a relieved perspiration forming upon his forehead.

"What next?" he asked.

"Which is the logical place on this planet to report our presence and seek help?" countered Rygeef. "Think of it, and we will do the process again—"

About fifteen minutes later—after Radigan's concentration had slipped once or twice—they emerged again into normal space a few inches above one of the excessively neat lawns surrounding the capital of Terra.

"Where is this?" inquired Rygeef, his three eyes busily scanning the huge but delicately curved dome.

"It's on an artificial island, and built to symbolize our expansion into space," answered Radigan absently.

He looked about for the nearest entrance.

"Let's get out and try over there," he suggested, pointing.

"Why emerge?" asked the monster. "It is easier to make invisible the force cyst and . . . how would you express it? . . . and wear it about us. I recommend that you hand to me the control."

"You won't—"

"How could I? retorted Rygeef, with a spasm of his bulbous features that would do for a sneer. "I do not yet know my direction."

Radigan shrugged and delivered up the black cube. The monster manipulated certain studs, and the shield of force became completely limpid.

"Just stand normally," he advised Radigan, assuming, himself, the attitude of a pompous gargoyle. "I have set things to drift slowly up to those three individuals outside what I suspect to be an entrance to this hive."

Radigan threw him an indignant look, but realized in time to save himself embarrassment that the "hive" analogy must have originated in his own thoughts. He stood up straight and faced the uniformed guards loitering at the foot of a short flight of marble steps.

This trio presently pivoted, one at a time, and trained their combined scrutiny upon Radigan and his bulky companion. The spaceman attempted a jaunty grin which was spoiled by an overpowering impulse to peep downward at the grass flowing past under his feet. With Rygeef, he slowed to a halt over the concrete walk leading to the steps.

"You apparently are produced in many colors," commented the monster in Radigan's ear. "One is almost black, one is a yellowish tan, and the third is beginning to turn red."

"So I see," murmured Radigan unhappily.

"Are you beings ranked by facial shades?"

"That's a matter for debate," whispered the spaceman. "Be quiet!"

"What debate, mister?" demanded the guard who, as Rygeef had noted, was turning pink. "Where do you think you're going with that exhibit?"

"This is no exhibit," said Radigan. "This is Mr. Rygeef, a citizen of . . . what was it?"

"Khonyl."

"A citizen of Khonyl."

"He look to me more like something to dry and make into powdered medicine," commented the yellow-skinned guard. "We call sergeant, maybe?"

"Maybe. All right, you in the imitation spacesuit! If he's from one of the known worlds, let him show his papers!"

"Papers? echoed Radigan.

"Why should I carry that sort of record?" Rygeef injected into the awkward pause. "Here is my identification."

From some recess in its metallic gleaming harness, the creature produced an emerald disk about two inches in diameter. This was passed to Radigan, who held it out as far as he could without struggling against the invisible, temporarily resilient wall of force.

The three uniformed men craned forward to examine the object, none of them

unwary enough to try touching it. The tall black man pulled his red-faced colleague back by the sleeve.

"What's it supposed to be?" demanded the latter, retreating a pace.

"Upon the proper machine," explained Rygeef, "this disk will reproduce a vocalized account of my identity and planet of origin. I fear perhaps you will not the language understand. I am happy to translate."

The trio regarded the monster with cold, severe expressions. The yellow man allowed his hand to drop unobtrusively to his hip.

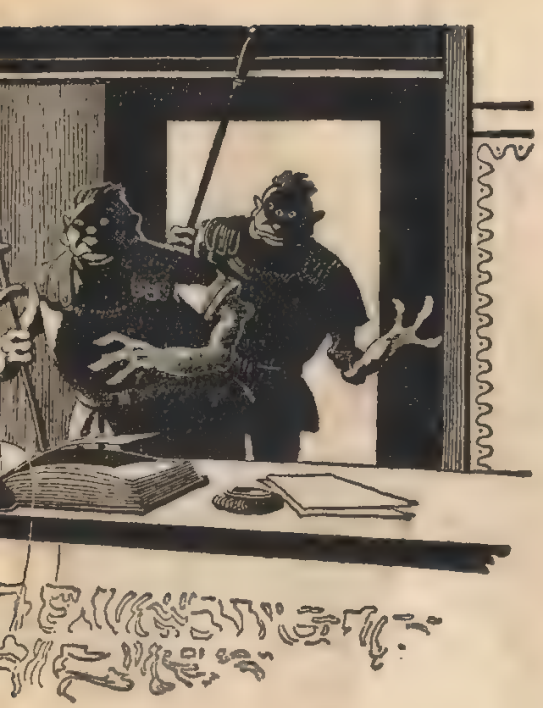
"Time the bunch of us had a little interview," decided the choleric guard. "If this what-is-it was from any registered planet, we'd have had to memorize his characteristics."

"As far as we know," agreed his dark-skinned companion, "such a creature has never been authorized."

"Now, wait a minute, fellows!" objected Radigan. "Mr. Rygeef comes from a planet that has just made contact with us. His description couldn't be posted here yet."

"And why not?" the truculent guard wanted to know. "How'd you get through Lunar customs?"

"Well . . . as a matter of fact, we didn't come by way of Luna—"



"Oh, illegal entry, too! And just when and by who was this new planet discovered?"

"To tell the truth," said Radigan, fighting off a desperate sensation of being mired in quicksand, "the planet itself hasn't yet been visited. As for Rygeef, personally made this contact."

"Yeah? When and where?"

"On the fifth planet of Procyon, just about half an hour ago—Uh . . . that is to say—TURN THE THING ON, RYGEEF!"

The flickering, varicolored cocoon of force flowed strongly about them in an instant, blanking out the sight of outraged faces and reaching hands.

No sound penetrated, nor was there any sign inside the shield of the collision that must have taken place with shocking abruptness. The shrinking Radigan had seen one hamlike hand within a foot of clutching his equipment belt.

"We are safe, for the time," Rygeef assured him. "You are indeed a suspicious race. What shall we do now?"

"I just don't know," admitted Radigan.

He glanced about, then sat down dejectedly on the curving floor of the cell. He wondered whether the spot hovered over soft grass or hard concrete.

"If I may suggest," said Rygeef, "we would more likely receive appropriate examination on my world. I will keep our bargain—it promises interest. Now, if you do not mind describing to me the direction from here to the star where we met—?"

Radigan shrugged. With a sigh, he began the task of assembling his supply of astronomical knowledge.

The trip out from Sol took a bit longer because Rygeef paused for a peep at Procyon to check his bearings.

The next stop revealed a somber, cloudy world, marked at their landing spot by low, thick vegetation and low, squat buildings of stone.

"Ah, the peace to the eyes, after that riot of color!" wheezed Rygeef.

"Where are we?" inquired Radigan, arousing from his mortification to take an interest in their surroundings.

"We shall go directly to the center of the skeleton government which is all we of Khonyl require," announced Rygeef, manipulating the black cube. "Later, I shall return to the science center here, from which I began my exploratory test."

The flickering shield closed in again. When it lifted, the scenery had changed, but not sufficiently to counter Radigan's impression of dull austerity.

"You have solid buildings," he commented.

"Naturally, there must be space for certain officials, but you will see that

things are arranged in a simpler, more informal manner. We of Khonyl have only the necessary minimum of regulations."

Radigan eyed the rows of squat, gray stone buildings, monotonously rectangular and flat-roofed. He wondered what the style revealed of the local bureaucratic mind, and he feared the stodgiest reality.

Still, he had to admit, Rygeef got the now-invisible force cyst to drift with them through the entrance of one building with no formalities at all. A few bulky, gray-skinned individuals with reddish or purplish thatches atop their round heads clumped to and fro on numerous feet; but none seemed to take any special interest in the visiting pair.

Rygeef examined a mass of symbols written upon one gray wall in luminous, bluish paint.

"We are in the wrong building," the monster announced.

They drifted out the door again, along a paved walk between the massive structures, and into another entrance. Inside, this time, they discovered a sturdy stone counter, deeply carved with symbols and patterns that Radigan found meaningless. Behind it, on a slightly higher level, loitered a monster with a purplish head growth and a skin baggier and grayer than any the Terran had yet noticed.

This one glanced at Rygeef, scanned Radigan from helmet to boots, and finally refocused upon the explorer from Khonyl.

The bureaucrat behind the counter buzzed inquiringly at Rygeef, and Radigan realized with perfect certainty that the question had been, "Did you want something with the Customs Department?"

"Say, Rygeef," he whispered, "how is it I can understand him?"

"You do not," replied the monster. "You are still receiving my mental projections. Since I have been thinking at you for some time now, I automatically put this one's question into your style of thought. It is simpler so."

The gray hulk behind the counter leaned forward.

"Who was it you just called simple?" it asked unpleasantly. "And, by the way, what is the object you have there?"

"This," replied Rygeef, "is a being of the planet Terra, named Radigan. I brought it back to Khonyl with me."

"Well, now, we must check that origin," said the official.

One forelimb reached beneath the counter and came up with a thick object that Radigan recognized as a book despite a peculiar shape of binding. There must have been a thousand pages of some shiny material halfway in appearance between silk and aluminium foil. The monster turned a number of leaves, scanning them with eyes roving independently. At length, Radigan received the full battery of the jet-orbed stare.

"What planet?"

"Terra," repeated Rygeef. "You will not find it listed yet. I have just discovered it."

"So!" The official glowered importantly. " You should know that regulations forbid the importation of pets without an adequate period of quarantine."

"Whaddya mean, 'pet'?" demanded Radigan.

The customs monster ignored him.

"It is hardly a pet," answered Rygeef. "Despite its weird looks, it is a perfectly rational being, not far inferior in attainments to us of Khonyl."

"A likely story!" scoffed the other. "I think you imagine yourself a joker, but just to be serviceable, I shall test this claim."

Silence fell as the official turned a penetrating scrutiny upon Radigan. The Terran bore it for a few moments, but could not help fidgeting a bit.

"Well, what have you to say now?" demanded the customs clerk, thrusting its unlovely visage at Rygeef. "I thought right at it. Did it give any sign of enlightenment? No!"

"You don't look too bright to me, either," muttered Radigan, scowling.

Again, he was ignored, as Rygeef spoke.

"That was because I did not translate to its language," claimed the explorer. "I have become accustomed to its style of thought."

"Let us make this clear," suggested the monster behind the counter. "Do you claim to be a returning traveler or an animal trainer? If the latter, the proper department is Export and Import, to begin with anyway. I will give you some forms to fill out—"

"You blubber-ball!" said Radigan. "Who are you to call me an animal, anyway?"

"There!" buzzed the official exultantly. "I distinctly heard it growl at me! Are you sure it is safe in that glass muzzle? You will be responsible if it injures anyone, you know."

Before Rygeef could answer, the other reached across the counter and rapped on Radigan's visor with one three-digited foreleg.

The Terran jerked his head back as nimbly as was possible in a spacesuit. Raising his right hand, he angrily slapped the monster's limb away.

He had forgotten the heavy gauntlet of his suit. The official leaped back with a banshee yell, clasping the bruised member in its other forefoot. It danced about behind the counter, tripped over something, and disappeared to the accompaniment of shrieks and rubbery thuds.

Radigan restrained himself from climbing the counter when Rygeef pointed to a doorway at the rear of the enclosed space.

Two monsters clad in dark-red harness were issuing from the room beyond, and at a gallop. Their skin was light-gray and unwrinkled. Besides bearing long staffs, they showed every evidence of being young and in good condition.

The customs official reappeared, pulling itself up behind the counter. Radigan suspected that its features were contorted with pain, but it was difficult for him to be sure. There was, on the other hand, little doubt as to the quality of the stares directed at him by the oncoming reserves. Though originating in markedly alien surroundings, the look had much in common with that which he had received from the guards outside the Terran capitol.

"It's come to this again," he muttered to Rygeef.

"I must apply the usual remedy," answered the other sadly.

The force cyst flowed into visibility about them once more, and the external threat was blotted out. Rygeef stared reflectively at the black cube he held.

"We ought to back up and start all over again," grumbled Radigan.

"Perhaps," replied the monster thoughtfully, "it would be best to return and not start at all."

"How's that?"

"I shall attempt to reach Procyon again. There, if we can find the right planet, you may return to your ship as if nothing had ever happened."

Radigan nodded resignedly.

"It *would* be a relief," he admitted. "Still . . . we ought to at least exchange coördinates. Now that our races have met, it seems a shame to lose contact. The galaxy isn't over-stocked with civilizations."

Rygeef was silent, examining the black cube with patient interest. At last, the creature from Khonyl looked directly at Radigan.

"I agree. Perhaps those who come after us will have better chance at the next contact. A small preparation is all that should be necessary. It is also possible that I may supply you with the means to return to Khonyl."

The Terran watched as the black cube was unfolded into two halves by the monster's triple-digited members. From the half opposite the studded face, Rygeef drew a small black box.

"This is meant as an emergency control. You will note that the studs are less numerous, so it should be possible for me to explain their function to you before we part."

"Will that little thing carry me the way we've been going?" asked Radigan skeptically.

"Since it taps energy of the galaxy, you have to need no fear. It is just that some . . . tricks . . . it can not do. But first, we must find this star you call Procyon."

After arriving in the vicinity of Procyon's fifth planet, it required only four attempts to bring the force cyst to rest in a spot within easy walking distance of Radigan's ship. Radigan, under constant coaching, achieved one of the shifts; and its failure to carry them to any desirable spot was interpreted by Rygeef as evidence of forgetting the terrain rather than as clumsiness with the control cube.

"It would perhaps be well for you to experiment cautiously against the time when you may wish to contact Khonyl," the monster advised. "Until such time, I shall desire good chances for you."

"Good luck to you, too," said Radigan.

He found that he regretted the parting, for he was beginning to get used to Rygeef's monstrous appearance. It was difficult, also, to dispel a certain awe at the gift that had been thrust upon him. He wondered, if the positions had been reversed, whether he would have managed such generous coöperation.

"I'll get in touch with you for sure!" he promised, slipping through a gap in the shield that Rygeef opened for him.

The gully in which he stood after the force cyst had disappeared from visibility led him down to the plain where the exploring ship had landed. Radigan trudged doggedly across the stony expanse of waste land and eventually reached the towering spacecraft.

Two men, suited but with their helmets open, were evidently packing the last few odds and ends of equipment onto a tracked vehicle. One of them was making a determined, though only partly successful, effort at smoking a pipe. The other, a bantam redhead, put down a folding pick to watch Radigan come up.

"Hi, Johnson," said the prodigal son.

"Where've you been?" demanded Johnson. "Thought for a while the Old Man was gonna sidetrack our party to search for you."

"Party?"

"Yeah. Jimmy, here, and Conn and I are fixin' to take a turn around these hills to see what might be dug out of them—if anything. Conn's just now up talking to the Old Man about looking you up first. All the others that went out on foot were back hours ago. Where you been?"

Radigan looked back at the hills, then glanced at the ladder up which he would presently climb on his way to some crowded nook in the ship where he could examine his black control box in detail. The question was so totally beyond his ability to answer rationally that he could think of no rejoinder.

"Oh, I got around a little," he offered weakly.

He held Rygeef's instrument unobtrusively behind his hip and tried to change the subject.

"You guys are going to look through the hills?" he asked.

"Yup," said Jimmy, removing the dead pipe regretfully from his mouth. "Got any tips for when we get there?"

"Just one," said Radigan. "Stay out of caves. Can't tell what you might fall into."

He glanced up at the sky as he started up the ladder.

I'll have to come out after dark, he reminded himself, *and get a good fix on Sol. Next time I get lost, it won't be where the boys can find me.*

THE END

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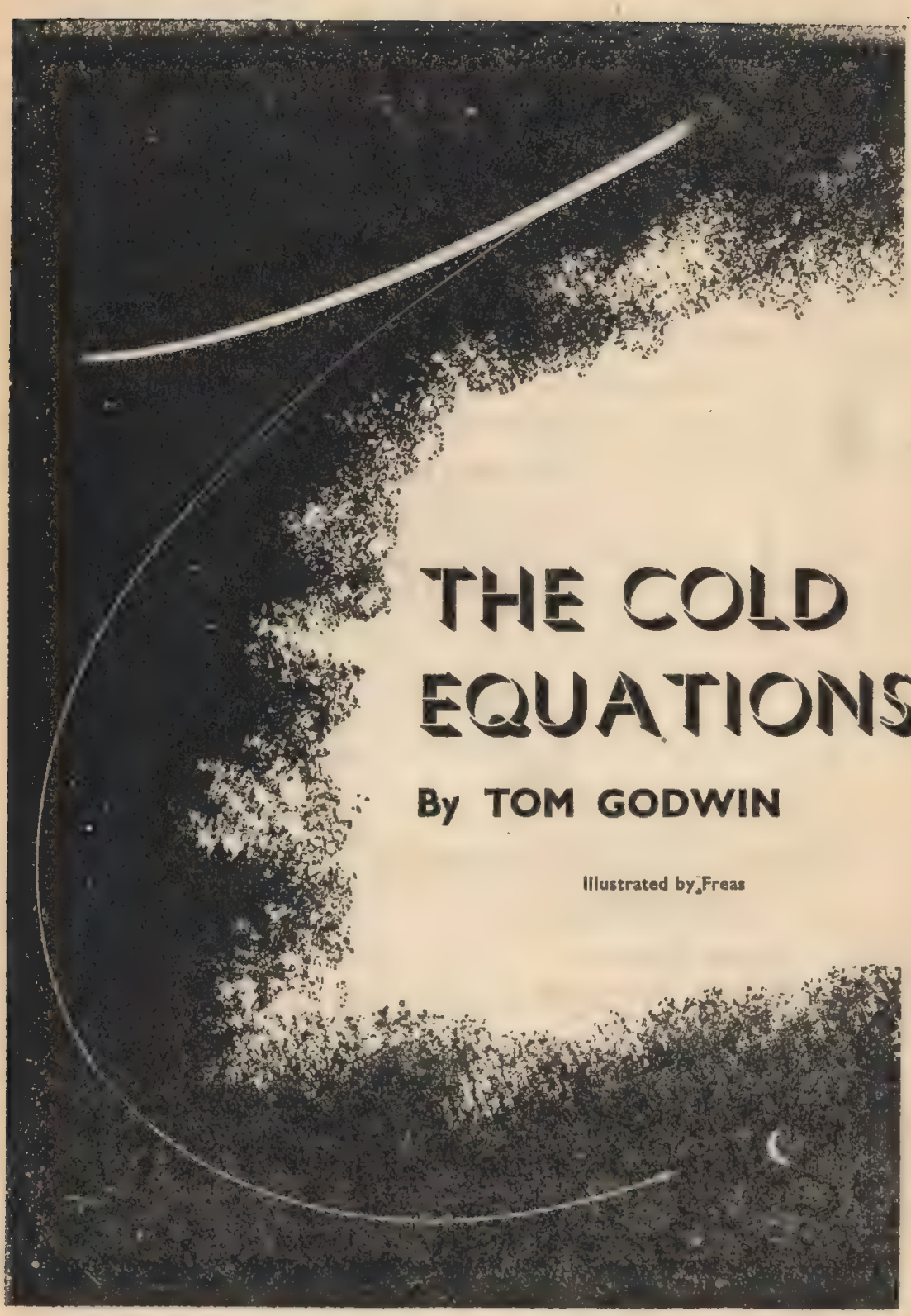


THE COLD EQUATIONS

By TOM GODWIN

Illustrated by Freas

The Frontier *is a strange place—and a frontier is not always easy to recognize. It may lie on the other side of a simple door marked "No Admittance"—but it is always deadly dangerous.*

HE was not alone.

There was nothing to indicate the fact but the white hand of the tiny gauge on the board before him. The control room was empty but for himself; there was no sound other than the murmur of the drives—but the white hand had moved. It had been on zero when the little ship was launched from the *Stardust*; now, an hour later, it had crept up. There was something in the supplies closet across the room, it was saying, some kind of a body that radiated heat.

It could be but one kind of a body—a living, human body.

He leaned back in the pilot's chair and drew a deep, slow breath, considering what he would have to do. He was an EDS pilot, inured to the sight of death, long since accustomed to it and to viewing the dying of another man with an objective lack of emotion, and he had no choice in what he must do. There could be no alternative—but it required a few moments of conditioning for even an EDS pilot to prepare himself to walk across the room and coldly, deliberately, take the life of a man he had yet to meet.

He would, of course, do it. It was the law, stated very bluntly and definitely in grim Paragraph L, Section 8, of Interstellar Regulations: *Any stowaway discovered in an EDS shall be jettisoned immediately following discovery.*

It was the law, and there could be no appeal.

It was a law not of men's choosing but made imperative by the circumstances of the space frontier. Galactic expansion had followed the development of the hyperspace drive and as men scattered wide across the frontier there had come the problem of contact with the isolated first-colonies and exploration parties. The huge hyperspace cruisers were the product of the combined genius and effort of Earth and were long and expensive in the building. They were not available in such numbers that small colonies could possess them. The cruisers carried the colonists to their new worlds and made periodic visits, running on tight schedules, but they could not stop and turn aside to visit colonies scheduled to be visited at another time; such a delay would destroy their schedule and produce a confusion and uncertainty that would wreck the complex interdependence between old Earth and the new worlds of the frontier.

Some method of delivering supplies or assistance when an emergency occurred on a world not scheduled for a visit had been needed and the Emergency Dispatch Ships had been the answer. Small and collapsible, they occupied little room in the hold of the cruiser; made of light metal and plastics, they were driven by a small rocket drive that consumed relatively little fuel. Each cruiser carried four EDS's and when a call for aid was received the nearest cruiser would drop into normal space long enough to launch an EDS with the needed supplies or personnel, then vanish again as it continued on its course.

The cruisers, powered by nuclear converters, did not use the liquid rocket fuel but nuclear convertors were far too large and complex to permit their installation in the EDS's. The cruisers were forced by necessity to carry a limited amount of

the bulky rocket fuel and the fuel was rationed with care; the cruiser's computers determining the exact amount of fuel each EDS would require for its mission. The computers considered the course coördinates, the mass of the EDS, the mass of pilot and cargo; they were very precise and accurate and omitted nothing from their calculations. They could not, however, foresee, and allow for, the added mass of a stowaway.

The *Stardust* had received the request from one of the exploration parties stationed on Woden; the six men of the party already being stricken with fever carried by the green *kala* midges and their own supply of serum destroyed by the tornado that had torn through their camp. The *Stardust* had gone through the usual procedure; dropping into normal space to launch the EDS with the fever serum, then vanishing again in hyperspace. Now, an hour later, the gauge was saying there was something more than the small carton of serum in the supplies closet.

He let his eyes rest on the narrow white door of the closet. There, just inside, another man lived and breathed and was beginning to feel assured that discovery of his presence would now be too late for the pilot to alter the situation. It *was* too late—for the man behind the door it was far later than he thought and in a way he would find terrible to believe.

There could be no alternative. Additional fuel would be used during the hours of deceleration to compensate for the added mass of the stowaway; infinitesimal increments of fuel that would not be missed until the ship had almost reached its destination. Then, at some distance above the ground that might be as near as a thousand feet or as far as tens of thousands of feet, depending upon the mass of ship and cargo and the preceding period of deceleration, the unmissed increments of fuel would make their absence known; the EDS would expend its last drops of fuel with a sputter and go into whistling free fall. Ship and pilot and stowaway would merge together upon impact as a wreckage of metal and plastic, flesh and blood, driven deep into the soil. The stowaway had signed his own death warrant when he concealed himself on the ship; he could not be permitted to take seven others with him.

He looked again at the telltale white hand, then rose to his feet. What he must do would be unpleasant for both of them; the sooner it was over, the better. He stepped across the control room, to stand by the white door.

"Come out!" His command was harsh and abrupt above the murmur of the drive.

It seemed he could hear the whisper of a furtive movement inside the closet, then nothing. He visualized the stowaway cowering into one corner, suddenly worried by the possible consequences of his act and his self-assurance evaporating.

"I said *out*!"

He heard the stowaway move to obey and he waited with his eyes alert on the door and his hand near the blaster at his side.

The door opened and the stowaway stepped through it, smiling. "All right—I give up. Now what?"

It was a girl.

He stared without speaking, his hand dropping away from the blaster and acceptance of what he saw coming like a heavy and unexpected physical blow.

The stowaway was not a man—she was a girl in her teens, standing before him in little white gypsy sandals with the top of her brown, curly head hardly higher than his shoulder, with a faint, sweet scent of perfume coming from her and her smiling face tilted up so her eyes could look unknowing and unafraid into his as she waited for his answer.

Now what? Had it been asked in the deep, defiant voice of a man he would have answered it with action, quick and efficient. He would have taken the stowaway's identification disk and ordered him into the air lock. Had the stowaway refused to obey, he would have used the blaster. It would not have taken long; within a minute the body would have been ejected into space—had the stowaway been a man.

He returned to the pilot's chair and motioned her to seat herself on the boxlike bulk of the drive-control units that set against the wall beside him. She obeyed, his silence making the smile fade into the meek and guilty expression of a pup that has been caught in mischief and knows it must be punished.

"You still haven't told me," she said. "I'm guilty, so what happens to me now? Do I pay a fine, or what?"

"What are you doing here?" he asked. "Why did you stow away on this EDS?"

"I wanted to see my brother. He's with the government survey crew on Woden and I haven't seen him for ten years, not since he left Earth to go into government survey work."

"What was your destination on the *Stardust*?"

"Mimir. I have a position waiting for me there. My brother has been sending money home all the time to us—my father and my mother and I—and he paid for a special course in linguistics I was taking. I graduated sooner than expected and I was offered this job on Mimir. I knew it would be almost a year before Gerry's job was done on Woden so he could come on to Mimir and that's why I hid in the closet, there. There was plenty of room for me and I was willing to pay the fine. There were only the two of us kids—Gerry and I—and I haven't seen him for so long, and I didn't want to wait another year when I could see him now, even though I knew I would be breaking some kind of a regulation when I did it."

I knew I would be breaking some kind of a regulation—In a way, she could not be blamed for her ignorance of the law; she was of Earth and had not realized that the laws of the space frontier must, of necessity, be as hard and relentless as the environment that gave them birth. Yet, to protect such as her from the results of their own ignorance of the frontier, there had been a sign over the door that led to the section of the *Stardust* that housed the EDS's; a sign that was plain for all to see and heed:

UNAUTHORIZED PERSONNEL
KEEP OUT!

"Does your brother know that you took passage on the *Stardust* for Mimir?"

"Oh, yes. I sent him a spacegram telling him about my graduation and about going to Mimir on the *Stardust* a month before I left Earth. I already knew Mimir was where he would be stationed in a little over a year. He gets a promotion then, and he'll be based on Mimir and not have to stay out a year at a time on field trips, like he does now."

There were two different survey groups on Woden, and he asked, "What is his name?"

"Cross—Gerry Cross. He's in Group Two—that was the way his address read. Do you know him?"

Group One had requested the serum; Group Two was eight thousand miles away, across the Western Sea.

"No, I've never met him," he said, then turned to the control board and cut the deceleration to a fraction of a gravity; knowing as he did so that it could not avert the ultimate end, yet doing the only thing he could do to prolong that ultimate end. The sensation was like that of the ship suddenly dropping and the girl's involuntary movement of surprise half lifted her from the seat.

"We're going faster now, aren't we?" she asked. "Why are we doing that?"

He told her the truth. "To save fuel for a little while."

"You mean, we don't have very much?"

He delayed the answer he must give her so soon to ask: "How did you manage to stowaway?"

"I just sort of walked in when no one was looking my way," she said. "I was practicing my Gelanese on the native girl who does the cleaning in the Ship's Supply office when someone came in with an order for supplies for the survey crew on Woden. I slipped into the closet there after the ship was ready to go and just before you came in. It was an impulse of the moment to stow away, so I could get to see Gerry—and from the way you keep looking at me so grim, I'm not sure it was a very wise impulse.

"But I'll be a model criminal—or do I mean prisoner?" She smiled at him again. "I intended to pay for my keep on top of paying the fine. I can cook and I can patch clothes for everyone and I know how to do all kinds of useful things, even a little bit about nursing."

There was one more question to ask:

"Did you know what the supplies were that the survey crew ordered?"

"Why, no. Equipment they needed in their work, I supposed."

Why couldn't she have been a man with some ulterior motive? A fugitive from justice, hoping to lose himself on a raw new world; an opportunist, seeking transportation to the new colonies where he might find golden fleece for the taking; a crackpot, with a mission—

Perhaps once in his lifetime an EDS pilot would find such a stowaway on his ship; warped men, mean and selfish men, brutal and dangerous men—but never, before, a smiling, blue-eyed girl who was willing to pay her fine and work for her keep that she might see her brother.

He turned to the board and turned the switch that would signal the *Stardust*. The call would be futile but he could not, until he had exhausted that one vain hope, seize her and thrust her into the air lock as he would an animal—or a man. The delay, in the meantime, would not be dangerous with the EDS decelerating at fractional gravity.

A voice spoke from the communicator. "*Stardust*. Identify yourself and proceed."

"Barton, EDS 34G11. Emergency. Give me Commander Delhart."

There was a faint confusion of noises as the request went through the proper channels. The girl was watching him, no longer smiling.

"Are you going to order them to come back after me?" she asked.

The communicator clicked and there was the sound of a distant voice saying, "Commander, the EDS requests—"

"Are they coming back after me?" she asked again. "Won't I get to see my brother, after all?"

"Barton?" The blunt, gruff voice of Commander Delhart came from the communicator. "What's this about an emergency?"

"A stowaway," he answered.

"A stowaway?" There was a slight surprise to the question. "That's rather unusual—but why the 'emergency' call? You discovered him in time so there should be no appreciable danger and I presume you've informed Ship's Records so his nearest relatives can be notified."

"That's why I had to call you, first. The stowaway is still aboard and the circumstances are so different—"

"Different?" the commander interrupted, impatience in his voice. "How can they be different? You know you have a limited supply of fuel; you also know the law, as well as I do: 'Any stowaway discovered in an EDS shall be jettisoned immediately following discovery.'"

There was the sound of a sharply indrawn breath from the girl. "*What does he mean?*"

"The stowaway is a girl."

"*What?*"

"She wanted to see her brother. She's only a kid and she didn't know what she was really doing."

"I see." All the curtness was gone from the commander's voice. "So you called me in the hope I could do something?" Without waiting for an answer he went on. "I'm sorry—I can do nothing. This cruiser must maintain its schedule; the life of not one person but the lives of many depend on it. I know how you feel but I'm powerless to help you. You'll have to go through with it. I'll have you connected with Ship's Records."

The communicator faded to a faint rustle of sound and he turned back to the girl. She was leaning forward on the bench, almost rigid, her eyes fixed wide and frightened.

"What did he mean, to go through with it? To jettison me . . . to go through with it—what did he mean? Not the way it sounded . . . he couldn't have. What did he mean . . . what did he really mean?"

Her time was too short for the comfort of a lie to be more than a cruelly fleeting delusion.

"He meant it the way it sounded."

"*No!*" She recoiled from him as though he had struck her, one hand half upraised as though to fend him off and stark unwillingness to believe in her eyes.

"It will have to be."

"No! You're joking—you're insane! You can't mean it!"

"I'm sorry." He spoke slowly to her, gently. "I should have told you before—I should have, but I had to do what I could first; I had to call the *Stardust*. You heard what the commander said."

"But you can't—if you make me leave the ship, I'll *die*."

"I know."

She searched his face and the unwillingness to believe left her eyes, giving way slowly to a look of dazed terror

"You—know?" She spoke the words far apart, numb and wonderingly.

"I know. It has to be like that."

"You mean it—you really mean it." She sagged back against the wall, small and limp like a little rag doll and all the protesting and disbelief gone. "You're going to do it—you're going to make me die?"

"I'm sorry," he said again. "You'll never know how sorry I am. It has to be that way and no human in the universe can change it."

"You're going to make me die and I didn't do anything to die for—I didn't *do* anything—"

He sighed, deep and weary. "I know you didn't, child. I know you didn't"—

"EDS." The communicator rapped brisk and metallic. "This is Ship's Records. Give us all information on subject's identification disk."

He got out of his chair to stand over her. She clutched the edge of the seat, her upturned face white under the brown hair and the lipstick standing out like a blood-red cupid's bow.

"*Now?*"

"I want your identification disk," he said.

She released the edge of the seat and fumbled at the chain that suspended the plastic disk from her neck with fingers that were trembling and awkward. He reached down and unfastened the clasp for her, then returned with the disk to his chair.

"Here's your data, Records: Identification Number T837—"

"One moment," Records interrupted. "This is to be filed on the gray card, of course?"

"Yes."

"And the time of the execution?"

"I'll tell you later."

"Later? This is highly irregular; the time of the subject's death is required before—"

He kept the thickness out of his voice with an effort. "Then we'll do it in a highly irregular manner—you'll hear the disk read, first. The subject is a girl and she's listening to everything that's said. Are you capable of understanding that?"

There was a brief, almost shocked, silence, then Records said meekly: "Sorry. Go ahead."

He began to read the disk, reading it slowly to delay the inevitable for as long as possible, trying to help her by giving her what little time he could to recover from her first terror and let it resolve into the calm of acceptance and resignation.

"Number T8374 dash Y54. Name: Marilyn Lee Cross. Sex: Female. Born: July 7, 2160. *She was only eighteen.* Height: 5 3. Weight: 110. *Such a slight weight, yet enough to add fatally to the mass of the shell-thin bubble that was an EDS.* Hair: Brown. Eyes: Blue. Complexion: Light. Blood Type: O. *Irrelevant data.* Destination: Port City Mimir. *In valid data—*"

He finished and said, "I'll call you later," then turned once again to the girl. She was huddled back against the wall, watching him with a look of numb and wondering fascination.

"They're waiting for you to kill me, aren't they? They want me dead, don't they? You and everybody on the cruiser wants me dead, don't you?" Then the numbness broke and her voice was that of a frightened and bewildered child. "Everybody wants me dead and I didn't *do* anything. I didn't hurt anyone—I only wanted to see my brother."

"It's not the way you think—it isn't that way, at all," he said. "Nobody wants it this way; nobody would ever let it be this way if it was humanly possible to change it."

"Then why is it! I don't understand. Why is it?"

"This ship is carrying *kala* fever serum to Group One on Wonde. Their own supply was destroyed by a tornado. Group Two—the crew your brother is in—is eight thousand miles away across the Western Sea and their helicopters can't cross it to help Group One. The fever is invariably fatal unless the serum can be had in time, and the six men in Group One will die unless this ship reaches them on schedule. These little ships are always given barely enough fuel to reach their destination and if you stay aboard your added weight will cause it to use up all its fuel before it reaches the ground. It will crash, then, and you and I will die and so will the six men waiting for the fever serum."

It was a full minute before she spoke, and as she considered his words the expression of numbness left her eyes.

"Is that it?" she asked at last. "Just that the ship doesn't have enough fuel?"

"Yes."

"I can go alone or I can take seven others with me—is that the way it is?"

"That's the way it is."

"And nobody wants me to have to die?"

"Nobody."

"Then maybe—Are you sure nothing can be done about it? Wouldn't people help me if they could?"

"Everyone would like to help you but there is nothing anyone can do. I did the only thing I could do when I called the *Stardust*."

"And it won't come back—but there might be other cruisers, mightn't there? Isn't there any hope at all that there might be someone, somewhere, who could do something to help me?"

She was leaning forward a little in her eagerness as she waited for his answer.

"No."

The word was like the drop of a cold stone and she again leaned back against the wall, the hope and eagerness leaving her face. "You're sure—you *know* you're sure?"

"I'm sure. There are no other cruisers within forty light-years; there is nothing and no one to change things."

She dropped her gaze to her lap and began twisting a pleat of her skirt between her fingers, saying no more as her mind began to adapt itself to the grim knowledge.

It was better so; with the going of all hope would go the fear; with the going of all hope would come resignation. She needed time and she could have so little of it. How much?

The EDS's were not equiped with hull-cooling units; their speed had to be reduced to a moderate level before entering the atmosphere. They were decelerating at .10 gravity; approaching their destination at a far higher speed than the computers had calculated on. The *Stardust* had been quite near Woden when she launched the EDS; their present velocity was putting them nearer by the second. There would be a critical point, soon to be reached, when he would have to resume deceleration. When he did so the girl's weight would be multiplied by the gravities of deceleration, would become, suddenly, a factor of paramount importance; the factor the computers had been ignorant of when they determined the amount of fuel the EDS should have. She would have to go when deceleration began; it could be no other way. When would that be—how long could he let her stay?

"How long can I stay?"

He winced involuntarily from the words that were so like an echo of his own thoughts. How long? He didn't know; he would have to ask the ship's computers. Each EDS was given a meager surplus of fuel to compensate for unfavorable conditions within the atmosphere and relatively little fuel was being consumed for the time being. The memory banks of the computers would still contain all data pertaining to the course set for the EDS; such data would not be erased until the EDS reached its destination. He had only to give the computers the new data; the girl's weight and the exact time at which he had reduced the deceleration to .10.

"Barton." Commander Delhart's voice came abruptly from the communicator, as he opened his mouth to call the *Stardust*. "A check with Records shows me you haven't completed your report. Did you reduce the deceleration?"

So the commander knew what he was trying to do.

"I'm decelerating at point ten," he answered. "I cut the deceleration at seventeen fifty and the weight is a hundred and ten. I would like to stay at point ten as long as the computers say I can. Will you give them the question?"

It was contrary to regulations for an EDS pilot to make any changes in the course or degree of deceleration the computers had set for him but the commander made no mention of the violation, neither did he ask the reason for it. It was not necessary for him to ask; he had not become commander of an interstellar cruiser without both intelligence and an understanding of human nature. He said only: "I'll have that given the computers."

The communicator fell silent and he and the girl waited, neither of them speaking. They would not have to wait long; the computers would give the answer within moments of the asking. The new factors would be fed into the steel maw of the first bank and the electrical impulses would go through the complex circuits. Here and there a relay might click, a tiny cog turn over, but it would be essentially the electrical impulses that found the answer; formless, mindless, invisible, determining with utter precision how long the pale girl beside him might live. Then five little segments of metal in the second bank would trip in rapid succession against an inked ribbon and a second steel maw would spit out the slip of paper that bore the answer.

The chronometer on the instrument board read 18:10 when the commander spoke again.

"You will resume deceleration at nineteen ten."

She looked toward the chronometer, then quickly away from it. "Is that when . . . when I go?" she asked. He nodded and she dropped her eyes to her lap again.

"I'll have the course corrections given you," the commander said. "Ordinarily I would never permit anything like this but I understand your position. There is nothing I can do, other than what I've just done, and you will not deviate from these new instructions. You will complete your report at nineteen ten. Now—here are the course corrections."

The voice of some unknown technician read them to him and he wrote them down on the pad clipped to the edge of the control board. There would, he saw, be periods of deceleration when he neared the atmosphere when the deceleration would be five gravities—and at five gravities, one hundred ten pounds would become five hundred fifty pounds.

The technician finished and he terminated the contact with a brief acknowledgment. Then, hesitating a moment, he reached out and shut off the communicator. It was 18.13 and he would have nothing to report until 19:10. In the meantime, it somehow seemed indecent to permit others to hear what she might say in her last hour.

He began to check the instrument readings, going over them with unnecessary slowness. She would have to accept the circumstances and there was nothing he could do to help her into acceptance; words of sympathy would only delay it.

It was 18:20 when she stirred from her motionlessness and spoke.

"So that's the way it has to be with me?"

He swung around to face her. "You understand now, don't you? No one would ever let it be like this if it could be changed."

"I understand," she said. Some of the color had returned to her face and the lipstick no longer stood out so vividly red. "There isn't enough fuel for me to stay; when I hid on this ship I got into something I didn't know anything about and now I have to pay for it."

She had violated a man-made law that said KEEP OUT but the penalty was not of men's making or desire and it was a penalty men could not revoke. A physical law had decreed: *h amount of fuel will power an EDS with a mass of m safely to its destination:* and a second physical law decreed: *h amount of fuel will not power an EDS with a mass of m plus x safely to its destination.*

EDS's obeyed only physical laws and no amount of human sympathy for her could alter the second law.

"But I'm afraid. I don't want to die—not now. I want to live and nobody is doing anything to help me; everybody is letting me go ahead and acting just like nothing was going to happen to me. I'm going to die and nobody *cares.*"

"We all do," he said. "I do and the commander does and the clerk in Ship's Records; we all care and each of us did what little he could to help you. It wasn't enough—it was almost nothing—but it was all we could do."

"Not enough fuel—I can understand that," she said, as though she had not heard his own words. "But to have to die for it. *Me*, alone—"

How hard it must be for her to accept the fact. She had never known danger of death; had never known the environments where the lives of men could be as fragile and as fleeting as sea foam tossed against a rocky shore. She belonged on gentle Earth, in that secure and peaceful society where she could be young and gay and laughing with others of her kind; where life was precious and well-guarded and there was always the assurance that tomorrow would come. She belonged in that world of soft winds and warm suns, music and moonlight and gracious manners and not on the hard, bleak frontier.

"How did it happen to me, so terribly quickly? An hour ago I was on the *Stardust*, going to Mimir. Now the *Stardust* is going on without me and I'm going to die and I'll never see Gerry and Mama and Daddy again—I'll never see anything again."

He hesitated, wondering how he could explain it to her so she would really understand and not feel she had, somehow, been the victim of a reasonlessly cruel injustice. She did not know what the frontier was like; she thought in terms of safe-and-secure Earth. Pretty girls were not jettisoned on Earth; there was a law against it. On Earth her plight would have filled the newscasts and a fast black Patrol ship would have been racing to her rescue. Everyone, everywhere, would have known of Marilyn Lee Cross and no effort would have been spared to save her life. But this was not Earth and there were no Patrol ships; only the *Stardust*, leaving them behind at many times the speed of light. There was no one to help her, there would be no Marilyn Lee Cross smiling from the newscasts tomorrow. Marilyn Lee Cross would be but a poignant memory for an EDS pilot and a name on a gray card in Ship's Records.

"It's different here; it's not like back on Earth," he said. "It isn't that no one cares; it's that no one can do anything to help. The frontier is big and here along its rim the colonies and exploration parties are scattered so thin and far between. On Woden, for example, there are only sixteen men—sixteen men on an entire world. The exploration parties, the survey crews, the little first-colonies—they're all fighting alien environments, trying to make a way for those who will follow after. The environments fight back and those who go first usually make mistakes only once. There is no margin of safety along the rim of the frontier; there can't be until the way is made for the others who will come later, until the new worlds

are tamed and settled. Until then men will have to pay the penalty for making mistakes with no one to help them because there is no one *to* help them."

"I was going to Mimir," she said. "I didn't know about the frontier; I was only going to Mimir and *it's* safe."

"Mimir is safe but you left the cruiser that was taking you there."

She was silent for a little while. "It was all so wonderful at first; there was plenty of room for me on this ship and I would be seeing Gerry so soon . . . I didn't know about the fuel, didn't know what would happen to me—"

Her words trailed away and he turned his attention to the viewscreen, not wanting to stare at her as she fought her way through the black horror of fear toward the calm gray of acceptance.

Woden was a ball, enshrouded in the blue haze of atmosphere, swimming in space against the background of star-sprinkled dead blackness. The great mass of Manning's Continent sprawled like a gigantic hourglass in the Eastern Sea with the western half of the Eastern Continent still visible. There was a thin line of shadow along the right-hand edge of the globe and the Eastern Continent was disappearing into it as the planet turned on its axis. An hour before the entire continent had been in view, now a thousand miles of it had gone into the thin edge of shadow and around to the night that lay on the other side of the world. The dark blue spot that was Lotus Lake was approaching the shadow. It was somewhere near the southern edge of the lake that Group Two had their camp. It would be night there, soon, and quick behind the coming of night the rotation of Woden on its axis would put Group Two beyond the reach of the ship's radio.

He would have to tell her before it was too late for her to talk to her brother. In a way, it would be better for both of them should they not do so but it was not for him to decide. To each of them the last words would be something to hold and cherish, something that would cut like the blade of a knife yet would be infinitely precious to remember, she for her own brief moments to live and he for the rest of his life.

He held down the button that would flash the grid lines on the viewscreen and used the known diameter of the planet to estimate the distance the southern tip of Lotus Lake had yet to go until it passed beyond radio range. It was approximately five hundred miles. Five hundred miles; thirty minutes—and the chronometer read 18:30. Allowing for error in estimating, it could not be later than 19:05 that the turning of Woden would cut off her brother's voice.

The first border of the Western Continent was already in sight along the left side of the world. Four thousand miles across it lay the shore of the Western Sea and the Camp of Group One. It had been in the Western Sea that the tornado had originated, to strike with such fury at the camp and destroy half their prefabricated buildings, including the one that housed the medical supplies. Two days before the tornado had not existed; it had been no more than great gentle masses of air out over the calm Western Sea. Group One had gone about their routine survey work, unaware of the meeting of the air masses out at sea, unaware of the force the union was spawning. It had struck their camp without warning; a thundering, roaring destruction that sought to annihilate all that lay before it. It had passed on, leaving the wreckage in its wake. It had destroyed the labor of months and had doomed six men to die and then, as though its task was accomplished, it once more began to resolve into gentle masses of air. But for all its

deadliness, it had destroyed with neither malice nor intent. It had been a blind and mindless force, obeying the laws of nature, and it would have followed the same course with the same fury had men never existed.

Existence required Order and there was order; the laws of nature, irrevocable and immutable. Men could learn to use them but men could not change them. The circumstance of a circle was always pi times the diameter and no science of Man would ever make it otherwise. The combination of chemical A with chemical B under condition C invariably produced reaction D. The law of gravitation was a rigid equation and it made no distinction between the fall of a leaf and the ponderous circling of a binary star system. The nuclear conversion process powered the cruisers that carried men to the stars; the same process in the form of a nova would destroy a world with equal efficiency. The laws *were*, and the universe moved in obedience to them. Along the frontier were arrayed all the forces of nature and sometimes they destroyed those who were fighting their way outward from Earth. The men of the frontier had long ago learned the bitter futility of cursing the forces that would destroy them for the forces were blind and deaf; the futility of looking to the heavens for mercy, for the stars of the galaxy swung in their long, long sweep of two hundred million years, as inexorably controlled as they by the laws that knew neither hatred nor compassion.

The men of the frontier knew—but how was a girl from Earth to fully understand? *H amount of fuel will not power an EDS with a mass of m plus x safely to its destination.* To himself and her brother and parents she was a sweet-faced girl in her teens; to the laws of nature she was *x*, the unwanted factor in a cold equation.

She stirred again on the seat. "Could I write a letter? I want to write to Mama and Daddy and I'd like to talk to Gerry. Could you let me talk to him over your radio there?"

"I'll try to get him," he said.

He switched on the normal-space transmitter and pressed the signal button. Someone answered the buzzer almost immediately.

"Hello. How's it going with you fellows now—is the EDS on its way?"

"This isn't Group One; this is the EDS," he said. "Is Gerry Cross there?"

"Gerry? He and two others went out in the helicopter this morning and aren't back yet. It's almost sundown, though, and he ought to be back right away—in less than an hour at the most."

"Can you connect me through to the radio in his 'copter?"

"Huh-uh. It's been out of commission for two months—some printed circuits went haywire and we can't get any more until the next cruiser stops by. Is it something important—bad news for him, or something?"

"Yes—it's very important. When he comes in get him to the transmitter as soon as you possibly can."

"I'll do that; I'll have one of the boys waiting at the field with a truck. Is there anything else I can do?"

"No, I guess that's all. Get him there as soon as you can and signal me."

He turned the volume to an inaudible minimum, an act that would not affect the functioning of the signal buzzer, and unclipped the pad of paper from the control board. He tore off the sheet containing his flight instructions and handed the pad to her, together with pencil.

"I'd better write to Gerry, too," she said as she took them. "He might not get back to camp in time."

She began to write, her fingers still clumsy and uncertain in the way they handled the pencil and the top of it trembling a little as she poised it between words. He turned back to the viewscreen, to stare at it without seeing it.

She was a lonely little child, trying to say her last good-by, and she would lay out her heart to them. She would tell them how much she loved them and she would tell them to not feel badly about it, that it was only something that must happen eventually to everyone and she was not afraid. The last would be a lie and it would be there to read between the sprawling, uneven lines; a valiant little lie that would make the hurt all the greater for them.

Her brother was of the frontier and he would understand. He would not hate the EDS pilot for doing nothing to prevent her going; he would know there had been nothing the pilot could do. He would understand, though the understanding would not soften the shock and pain when he learned his sister was gone. But the others, her father and mother—they would not understand. They were of Earth and they would think in the manner of those who had never lived where the safety margin of life was a thin, thin line—and sometimes not at all. What would they think of the faceless, unknown pilot who had sent her to her death?

They would hate him with cold and terrible intensity but it really didn't matter. He would never see them, never know them. He would have only the memories to remind him; only the nights to fear, when a blue-eyed girl in gypsy sandals would come in his dreams to die again—

He scowled at the viewscreen and tried to force his thoughts into less emotional channels. There was nothing he could do to help her. She had unknowingly subjected herself to the penalty of a law that recognized neither innocence nor youth nor beauty, that was incapable of sympathy or leniency. Regret was illogical—and yet, could knowing it to be illogical ever keep it away?

She stopped occasionally, as though trying to find the right words to tell them what she wanted them to know, then the pencil would resume its whispering to the paper. It was 18:37 when she folded the letter in a square and wrote a name on it. She began writing another, twice looking up at the chronometer as though she feared the black hand might reach its rendezvous before she had finished. It was 18:45 when she folded it as she had done the first letter and wrote a name and address on it.

She held the letters out to him. "Will you take care of these and see that they're enveloped and mailed?"

"Of course." He took them from her hand and placed them in a pocket of his gray uniform shirt.

"These can't be sent off until the next cruiser stops by and the *Stardust* will have long since told them about me, won't it?" she asked. He nodded and she went on, "That makes the letters not important in one way but in another way they're very important—to me, and to them."

"I know. I understand, and I'll take care of them."

She glanced at the chronometer, then back at him. "It seems to move faster all the time, doesn't it?"

He said nothing, unable to think of anything to say, and she asked, "Do you think Gerry will come back to camp in time?"

"I think so. They said he should be in right away."

She began to roll the pencil back and forth between her palms. "I hope he does. I feel sick and scared and I want to hear his voice again and maybe I won't feel so alone. I'm a coward and I can't help it."

"No," he said, "you're not a coward. You're afraid, but you're not a coward."

"Is there a difference?"

He nodded. "A lot of difference."

"I feel so alone. I never did feel like this before; like I was all by myself and there was nobody to care what happened to me. Always, before, there was Mama and Daddy there and my friends around me. I had lots of friends, and they had a going-away party for me the night before I left."

Friends and music and laughter for her to remember—and on the viewscreen Lotus Lake was going into the shadow

"Is it the same with Gerry?" she asked. "I mean, if he should make a mistake, would he have to die for it, all alone and with no one to help him?"

"It's the same with all along the frontier; it will always be like that so long as there is a frontier."

"Gerry didn't tell us. He said the pay was good and he sent money home all the time because Daddy's little shop just brought in a bare living but he didn't tell us it was like this."

"He didn't tell you his work was dangerous?"

"Well—yes. He mentioned that, but we didn't understand. I always thought danger along the frontier was something that was a lot of fun; an exciting adventure, like in the three-D shows." A wan smile touched her face for a moment. "Only it's not, is it? It's not the same at all, because when it's real you can't go home after the show is over."

"No," he said. "No, you can't."

Her glance flicked from the chronometer to the door of the air lock then down to the pad and pencil she still held. She shifted her position slightly to lay them on the bench beside, moving one

foot out a little. For the first time he saw that she was not wearing Vegan gypsy sandals but only cheap imitations; the expensive Vegan leather was some kind of grained plastic, the silver buckle was gilded iron, the jewels were colored glass. *Daddy's little shop just brought in a bare living*—She must have left college in her second year, to take the course in linguistics that would enable her to make her own way and help her brother provide for her parents, earning what she could by part-time work after classes were over. Her personal possessions on the *Stardust* would be taken back to her parents—they would neither be of much value nor occupy much storage space on the return voyage.

"Isn't it—" She stopped, and he looked at her questioningly. "Isn't it cold in here?" she asked, almost apologetically. "Doesn't it seem cold to you?"

"Why, yes," he said. He saw by the main temperature gauge that the room was at precisely normal temperature. "Yes, it's colder than it should be."

"I wish Gerry would get back before it's too late. Do you really think he will, and you didn't just say so to make me feel better?"

"I think he will—they said he would be in pretty soon." On the viewscreen Lotus Lake had gone into the shadow but for the thin blue line of its western edge and it was apparent he had overestimated the time she would have in which to talk to her brother. Reluctantly, he said to her, "His camp will be out of radio range in a few minutes; he's on that part of Woden that's in the shadow"—he indicated the viewscreen—"and the turning of Woden will put him beyond contact. There may not be much time left when he comes in—not much time to talk to him before he fades out. I wish I could do something about it— I would call him right now if I could."

"Not even as much time as I will have to stay?"

"I'm afraid not."

"Then—" She straightened and looked toward the air lock with pale resolution. "Then I'll go when Gerry passes beyond range, I won't wait any longer after that—I won't have anything to wait for."

Again there was nothing he could say.

"Maybe I shouldn't wait at all. Maybe I'm selfish—maybe it would be better for Gerry if you just told him about it afterward."

There was an unconscious pleading for denial in the way she spoke and he said, "He wouldn't want you to do that, to not wait for him."

"It's already coming dark where he is, isn't it? There will be all the long night before him, and Mama and Daddy don't know yet that I won't ever be coming back like I promised them I would. I've caused everyone I love to be hurt, haven't I? I didn't want to—I didn't intend to."

"It wasn't your fault," he said. "It wasn't your fault at all. They'll know that. They'll understand."

"At first I was so afraid to die that I was a coward and thought only of myself. Now, I see how selfish I was. The terrible thing about dying like this is not that I'll be gone but that I'll never see them again; never be able to tell them that I didn't take them for granted; never be able to tell them I knew of the sacrifices they made to make my life happier, that I knew all the things they did for me and that I loved them so much more than I ever told them. I've never told them any of those things. You don't tell them such things when you're young and your life is all before you—you're afraid of sounding sentimental and silly.

"But it's so different when you have to die—you wish you had told them while you could and you wish you could tell them you're sorry for all the little mean things you ever did or said to them. You wish you could tell them that you didn't really mean to ever hurt their feelings and for them to only remember that you always loved them far more than you ever let them know."

"You don't have to tell them that," he said. "They will know—they've always known it."

"Are you sure?" she asked. "How can you be sure? My people are strangers to you."

"Wherever you go, human nature and human hearts are the same."

"And they will know what I want them to know—that I love them?"

"They've always known it, in a way far better than you could ever put in words for them."

"I keep remembering the things they did for me, and it's the little things they did that seem to be the most important to me, now. Like Gerry—he sent me a bracelet of fire-rubies on my sixteenth birthday. It was beautiful—it must have cost him a month's pay. Yet, I remember him more for what he did the night my kitten got run over in the street. I was only six years old and he held me in his arms and wiped away my tears and told me not to cry, that Flossy was gone for just a little while, for just long enough to get herself a new fur coat and she would be on the foot of my bed the very next morning. I believed him and quit crying and went to sleep dreaming about my kitten coming back. When I woke up the next morning, there was Flossy on the foot of my bed in a brand-new white fur coat, just like he had said she would be."

"It wasn't until a long time later that Mama told me Gerry had got the pet-shop owner out of bed at four in the morning and, when the man got mad about it, Gerry told him he was either going to go down and sell him the white kitten right then or he'd break his neck."

"It's always the little things you remember people by; all the little things they did because they wanted to do them for you. You've done the same for Gerry and your father and mother; all kinds of things that you've forgotten about but they will never forget."

"I hope I have. I would like for them to remember me like that."

"They will."

"I wish—" She swallowed. "The way I'll die—I wish they wouldn't ever think of that. I've read how people look who have die in space—their insides all ruptured and exploded and their lungs out between their teeth and then, a few seconds later, they're all dry and shapeless and horribly ugly. I don't want them to ever think of me as something dead and horrible, like that."

"You're their own, their child and their sister. They could never think of you other than the way you would want them to; the way you looked the last time they saw you."

"I'm still afraid," she said. "I can't help it, but I don't want Gerry to know it. If he gets back in time, I'm going to act like I'm not afraid at all and—"

The signal buzzer interrupted her, quick and imperative.

"Gerry!" She came to her feet. "It's Gerry, now!"

He spun the volume control knob and asked: "Gerry Cross?"

"Yes," her brother answered, an undertone of tenseness to his reply. "The bad news—what is it?"

She answered for him, standing close behind him and leaning down a little toward the communicator, her hand resting small and cold on his shoulder.

"Hello, Gerry." There was only a faint quaver to betray the careful casualness of her voice. "I wanted to see you—"

"Marilyn!" There was sudden and terrible apprehension in the way he spoke her name. "What are you doing on that EDS?"

"I wanted to see you," she said again. "I wanted to see you, so I hid on this ship—"

"You *hid* on it?"

"I'm a stowaway . . . I didn't know what it would mean—"

"*Marilyn!*" It was the cry of a man who calls hopeless and desperate to someone already and forever gone from him. "What have you done?"

"I . . . it's not—" Then her own composure broke and the cold little hand gripped his shoulder convulsively. "Don't, Gerry—I only wanted to see you; I didn't intend to hurt you. Please, Gerry, don't feel like that—"

Something warm and wet splashed on his wrist and he slid out of the chair, to help her into it and swing the microphone down to her level.

"Don't feel like that—Don't let me go knowing you feel like that—" The sob she tried to hold back choked in her throat and her brother spoke to her. "Don't cry, Marilyn." His voice was suddenly deep and infinitely gentle, with all the pain held out of it. "Don't cry, Sis—you musn't do that. It's all right, Honey—everything is all right."

"I—" Her lower lip quivered and she bit into it. "I didn't want you to feel that way—I just wanted us to say good-by because I have to go in a minute."

"Sure—sure. That's the way it will be, Sis. I didn't mean to sound the way I did." Then his voice changed to a tone of quick and urgent demand. "EDS—have you called the *Stardust?* Did you check with the computers?"

"I called the *Stardust* almost an hour ago. It can't turn back, there are no other cruisers within forty light-years, and there isn't enough fuel."

"Are you sure that the computers had the correct data—sure of everything?"

"Yes—do you think I could ever let it happen if I wasn't sure? I did everything I could do. If there was anything at all I could do now, I would do it."

"He tried to help me, Gerry." Her lower lip was no longer trembling and the short sleeves of her blouse were wet where she had dried her tears. "No one can help me and I'm not going to cry any more and everything will be all right with you and Daddy and Mama, won't it?"

"Sure—sure it will. We'll make out fine."

Her brother's words were beginning to come in more faintly and he turned the volume control to maximum. "He's going out of range," he said to her. "He'll be gone within another minute."

"You're fading out, Gerry," she said. "You're going out of range. I wanted to tell you—but I can't, now. We must say good-by so soon—but maybe I'll see you again. Maybe I'll come to you in your dreams with my hair in braids and crying because the kitten in my arms is dead; maybe I'll be the touch of a breeze that whispers to you as it goes by; maybe I'll be one of those gold-winged larks you told me about, singing my silly head off to you; maybe, at times, I'll be nothing you can see but you will know I'm there beside you. Think of me like that, Gerry; always like that and not—the other way."

Dimmed to a whisper by the turning of Woden, the answer came back:

"Always like that, Marilyn—always like that and never any other way."

"Our time is up, Gerry—I have to go, now. Good—" Her voice broke in mid-word and her mouth tried to twist into crying. She pressed her hand hard against it and when she spoke again the words came clear and true:

"Good-by, Gerry."

Faint and ineffably poignant and tender, the last words came from the cold metal of the communicator:

"Good-by, little sister—"

She sat motionless in the hush that followed, as though listening to the shadow-echoes of the words as they died away, then she turned away from the communicator, toward the air lock, and he pulled down the black lever beside him. The inner door of the air lock slid swiftly open, to reveal the bare little cell that was waiting for her, and she walked to it.

She walked with her head up and the brown curls brushing her shoulders, with the white sandals stepping as sure and steady as the fractional gravity would permit and the gilded buckles twinkling with little lights of blue and red and crystal. He let her walk alone and made no move to help her, knowing she would not want it that way. She stepped into the air lock and turned to face him, only the pulse in her throat to betray the wild beating of her heart.

"I'm ready," she said.

He pushed the lever up and the door slid its quick barrier between them, inclosing her in black and utter darkness for her last moments of life. It clicked as it locked in place and he jerked down the red lever. There was a slight waver to the ship as the air gushed from the lock, a vibration to the wall as though something had bumped the outer door in passing, then there was nothing and the ship was dropping true and steady again. He shoved the red lever back to close the door on the empty air lock and turned away, to walk to the pilot's chair with the slow steps of a man old and weary.

Back in the pilot's chair he pressed the signal button of the normal-space transmitter. There was no response; he had expected none. Her brother would have to wait through the night until the turning of Woden permitted contact through Group One.

It was not yet time to resume deceleration and he waited while the ship dropped endlessly downward with him and the drives purred softly. He saw that the white hand of the supplies closet temperature was on zero. A cold equation had been balanced and he was alone on the ship. Something shapeless and ugly was hurrying ahead of him, going to Woden where its brother was waiting through the night, but the empty ship still lived for a little while with the presence of the girl who had not known about the forces that killed with neither hatred nor malice. It seemed, almost, that she still sat small and bewildered and frightened on the metal box beside him, her words echoing hauntingly clear in the void she had left behind her:

I didn't do anything to die for—I didn't do *anything—*

THE END

ACHILLES AND THE TORTOISE

By GOTTHARD GUNTHER

Part Two *of Three Parts. Relativity shows that nothing can move in space faster than light. The interstellar cruiser becomes possible only if we can, somehow, transcend that limitation. And one way may be simply that of asking, and finding a new answer, to the deeply fundamental question, "What do you mean by 'motion'?"*

Part 2

The solution of a riddle or of a paradox is usually something in the nature of an anticlimax. The suspension is released, and the feeling of exciting wonderment has passed. A famous example is the story of the Gordian knot. When Alexander the Great conquered Asia he found in the city of Gordius an old chariot, its yoke fastened with a cord that was tied in a complicated knot. The cord was so artfully twisted that no one had ever been able to loosen it. Moreover, there was an oracular prophecy that he, who first would untie the knot, should rule Asia. Alexander tried, but he, too, failed. So he took his sword and "untied" the knot by cutting it in two.

I heard this story first as a small boy in school. But even then I had an uneasy feeling. This solution seemed to me rather—untidy. Hardly more than a fraud. Sure, I was given the usual interpretation of that famous incident: There are problems the intellect cannot solve, and only too often Man arrives at a puzzling impasse where only daring action can find a way out. This explanation did not satisfy me at all! Who said in the first place that the Gordian knot was untyable in the precise sense of the word? Well, no one ever did! The story only tells us that many tried, but nobody succeeded. That only proves the candidates were never good enough. And look at Alexander himself! He "solved" the problem in a manner of speaking, and got his Asiatic empire. But it was the most short-lived empire in the history of Man. It fell apart the day he died. It seems his method of untying the knot was only his private solution, not valid for anybody else.

The conventional solution of Zeno's paradox is just about in the same category. I pointed out in Part I that the riddle of Infinity, involved in the problem of motion, seems to be insoluble. But mathematicians discovered the infinitesimal calculus, i.e. a special procedure which permitted us to abandon the material concept of actual Infinity. They replaced Infinity by the operational idea of the limit. This opened for the very first time a way to demonstrate in an exact mathematical manner what every child has already learned by countless experiences: that the fast runner always overtakes the slow runner. Practically speaking, the

new infinitesimal method was of paramount impotrance. Modern technique and industry simply could not have been deveolped without the limit procedure. But hardly anything was gained as far as the precise theoretical concept of motion was concerned. It remained the mystery of old and defied all attempts to analyze it in rigid logical terms.

At this point an intellectually healthy and normal person is very much tempted to say: "So what if we do not understand motion? Newton's and Leibniz's calculus permits us to *use* it at will. And this is all that really counts. What else do you want?" Exactly, what else could we want? Well, what about interstellar space travel? We surely want that! But the first step toward it is to understand that all known forms of locomotion are utterly and absurdly useless when we face the problem: how to traverse interstellar distances! Therefore, our big question is: Are there any other as yet unknown and structurally different forms of motion which are neither exemplified in our daily lives nor in the motion of the planets of a solar system in their orbits?

It is absolutely impossible to answer these and related questions satisfactorily unless we have a precise rational understanding of what motion really is. That means, unless we have positively succeeded in solving the problem of Zeno . . . instead of detouring it by eliminating its crucial element of actual Infinity. The infinitesimal calculus only demonstrated in definite mathematical terms that this mysterious X, called motion, is possible. Thank you very much! But nobody ever doubted it. On the other hand, a hundred years of symbolic logic have spoiled our taste. We want a solution of Zeno's paradox where the problem of Infinity is not carefully eliminated, but where Infinity itself takes part in the solution and provides the explanation to the riddle of motion. It is fortunate for us that Cantor's theories suggest that there is a transfinite concept of motion, and as this Cantorian idea of changing the location of an object in Space may be the mathematical basis of all future interstellar space travel it will pay off handsomely for us to have a last look at the theory of limits, and its logical shortcomings in relation to Cantor's arithmetic of Alephs.

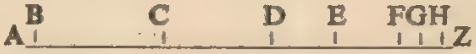
The theory of the differential limit only means that the quantities involved are *permitted* to decrease beyond any given number. There is no end to this process. But the fact that they are permitted to approach the limit of the infinitely small does not mean that they actually reach it. On the contrary, the very fact that the process is unending demands by definition that Infinity is never reached. Otherwise this endless process would have an end which would be a contradiction in itself. Consequently, every *actual* space-interval designated by this mathematical procedure has still a *finite* extension. Newton realized that already. Permit me to translate a significant statement from the Latin text of his "Tractatus de Curvata Curvarum". It says: " . . . I have intended to show that it is not necessary in the method of fluxions to introduce into geometry infinitely small figures."* This seems to be borne out by practical experience in modern experimental physics. One of the leading physicists of our time wrote only recently: "The latest development of nuclear physics suggests that there exists a 'minimum length' below which no decrease is possible".†

* In the original text: ". . . volui ostendere quod in methodo fluxionum non opus sit figuras infinite parvas on geometriam inducere." Incidentally, "method of fluxions" is Newton's original name for the differential calculus.

† Cf. C. F. von Weizsäcker, Zum Weltbild der Physik. 4th ed. Zürich 1949, p. 145.

It all boils down to the important fact that our traditional non-Cantorian system of mathematics considers Space as *having a quantized structure.* Space is made up, so to speak, of individual space-quants: tiny, discrete entities of pure extension. The limit theory only permits us to assume these space-quants to be as small as we want.

If we keep that in mind, it will be possible for us to understand why we are forced to think in Zeno's paradox, that Achilles can never overtake the tortoise. In order to make comprehension easier let us again lay out our race course:



Achilles starts from A, and the tortoise begins its race at the same time from B. The finish is at Z, a point which both racers are supposed to reach at the same time; the reason being that Achilles runs twice as fast as the animal. Now, if we are required to assume that Space is quantized, then Zeno's argument will be valid and good from now to doomsday. How so? Well, let us reformulate it, and it will become evident.

Zeno argues that the two racers must occupy exactly the same number of positions during the race. The following pattern of one-one relations illustrates what Zeno means:

(I) Achilles:	A	B	C	D	E	F	G..Z-1
	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓
(II) Tortoise:	B	C	D	E	F	G	H..Z
	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓
(III) Nr. of positions:	1	2	3	4	5	6	7..

As one can easily see, for any number of positions, n, Achilles is invariably one position behind the animal. If our hero were to catch the tortoise, he would have to occupy *one more* position during the same period of time. This is manifestly impossible; we have to cede that to Zeno. The intervals between the tortoise and its pursuer may progressively get smaller and smaller till they reach the order of magnitude of a space-quant. But no further decrease is possible. It follows that the number of such quants or physical—not mathematical!—points between A and Z is finite. And in the case of all finite sets a subset of a series is *not* numerically equivalent with the full series (cf. December 1954). Achilles must stay at least one space-quant behind the tortoise. Because for a finite series of positions Z and Z-1 are not identical.

Under the circumstances there seems to be no alternative left but to assume that the "smallest" segments of the line AZ have no longer any measurable length. They must be dimensionless points. But not even the summation of an infinite sequence of such points would produce a line segment of any measurable extension. Achilles starting from point one—identified with A— and moving to the successive points 2, 3, 4, 5, 6, 7, 8 . . . would never cover any distance. Because there is no distance between the points, and the points themselves have no spatial extension. All Achilles could do with his fastest running would be to stay in A.

Remember the story where Alice runs with the Red Queen? Let us see what Lewis Carroll had to say about it: "They went so fast that at last they seemed to

skim through the air, hardly touching the ground with their feet, till suddenly, just as Alice was getting quite exhausted, they stopped, and she found herself sitting on the ground, breathless, and giddy. . . . Alice looked round her in great surprise. 'Why, I do believe we've been under this tree the whole time! Everything is just as it was!' 'Of course it is,' said the Queen. 'What would you have it?' 'Well, in *our* country,' said Alice, still panting a little, 'you'd generally get somewhere else—if you ran very fast for a long time as we've been doing!' 'A slow sort of country!' said the Queen. Now, *here* you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!' " It seems Achilles and Alice run in a very fast country. Their running does not take them anywhere.

So far we have naïvely assumed that the number of points on our line segment AZ—the race course—is either finite or infinite. But we should not forget that the whole alternative "finite-infinite" belongs exclusively to the Cantorian number system of Aleph naught. It follows that our entire reasoning up to this point was based on the silent assumption that the structure of spatial extension—the continuum—can be adequately defined in terms of $\aleph_0$. Anybody who states that Zeno's paradox resolves into a problem of limits makes this very assumption.

The classical alternative of finite-infinite was, of course, unavoidable until very recently because it was believed, that the traditional concept of the ordinary Infinite represented the upper limit for all numerical systems. Cantor's discoveries have shattered this belief, and we now know—approximately seventy-five years—that the arithmetical concept of $\aleph_0$ is insufficient to give us a proper picture of the structural properties of the continuum. We are aware of the fact that the continuum can only be described with the help of the non-denumerable system of real numbers. This system is not merely infinite. It is transfinite and of the order of the cardinal number c. Under these circumstances it is evident that the general problem of motion depends in its solution on the nature of the continuum. We are bound to apply to it the arithmetic of non-denumerable transfinite c.

Naturally our next question should be: what is the difference between the arithmetic of denumerable and non-denumerable systems when used to measure distance in Space? An elementary drawing will help us again. Let

be two distances which are to be measured in terms of predetermined measuring units. And no change of the unit of measuring shall be permitted between AB and AZ. If we use denumerable numbers for our purpose, we shall find that *there is a definite relation between the number of measuring units and the length of a line segment*. In other words: the distance AB is shorter in terms of measuring units than the distance AZ. In order to indicate what we mean we might also use the ontological—existential—formulation: there are more space-quants between A and B then there are between A and Z.

This interpretation of our measuring procedure, however, is inadmissible if we define the distances AB and AZ in terms of non-denumerable numbers. We

have seen in our preceding article that the order of magnitude of all real—non-denumerable—numbers between 0 and 1 is already of the transfinite cardinal order of c. The same holds for all real numbers between 1 and 2, 2 and 3, 3 and 4 . . . or 0 and 2, 0 and 3, 0 and 4. . . . In fact the same quantitative relation exists generally between 0 and n, whereby n is permitted to increase without limit. In short a line a quintillionth of a millimeter long contains as many points— as designated by real numbers—as another line stretching from Earth to the last barely visible nebula in the Universe. As soon as we use the arithmetic of non-denumerable numbers we find that *there is no relation between the number of real points on a line and its length.*

As soon as we have reached this insight we are finally ready for a genuine solution of the problem of motion, as exemplified by the race between Achilles and the tortoise, It is impossible to solve Zeno's paradox in terms of a denumerable system of cardinal numbers. Achilles would never catch the animal ahead of him if there existed a rigid and invariant relation between our method of counting and the objective structure of Space. By "invariant relation" I mean a relation to the effect that the number of points we might count—no matter what technique of counting we might use—would *always* indicate the length of the measured line segment.

Zeno's thesis that Achilles must occupy as many positions as the tortoise is and remains unassailable. Equally true is that he must travel a greater distance than the animal. And if the greater distance contains more real points than the smaller one then it is impossible for him to catch up. This would be the case, indeed, if the ultimate reality of our space-time continuum could be adequately described in terms of *denumerable* numbers. Zeno discovered his paradox because he used only the denumerable numbers of the system of Aleph zero. By telling his story of Achilles and the tortoise he demonstrated the inadequacy of the classical number concept. The paradoxical situation which develops between Achilles and the animal clearly demonstrates that the problem of motion in space needs for its treatment a very different concept of number. Motion is a problem of the continuum, and therefore in its general form only treatable by an arithmetical system of transfinite magnitude. Zeno, of course, could not know this. He, therefore, drew from his absolutely correct thesis, i.e. that during the race *Achilles must occupy the same number of positions as his competitor*, the erroneous inference that in doing so he could not travel further than the tortoise. His conclusion would have been correct only if the run from A to Z actually contained *more* points—real numbers—than the shorter course from B to Z. This, we know now, is not the case! Therefore the solution to Zeno's problem is: *In the arithmetic of non-denumerable numbers Achilles occupies between A and Z no more and no less positions than the tortoise between B and Z.* Thus it is possible for Achilles to travel a longer distance than the animal although he occupies during the race the same number of positions—as Zeno correctly pointed out—as his opponent.*

* A note to mathematicians: yes. I know that Cantor's "positive theory of Infinite" provides a solution to Zeno's problem only if we do *not* identify mathematical "existence" with construction. However, if we do—as the revolutionary school of mathematical intuitionists (Kronecker, Brouwer) insists we should—Zeno's problem is mathematically speaking still unsolved. But Kronecker's "revolution" would banish all but the positive integers from mathematics. This seems a rather larger order!

This teaches us a fundamental lesson for all future interstellar space travel: The objective distance between two points in Space, let us say, between Earth and the Crab Nebula, can never be established by counting the absolute number of points between. No matter how short or how long a line segment, it always has the same number of real points, and the number in question is invariably the transite cardinal number c. The following statement may be difficult to digest even for a willing reader, but it is true just the same: measured in the system of real numbers the distance between Earth and Crab Nebula is neither longer nor shorter than the space-interval between Earth and Moon. We naturally struggle against this revolutionary idea because we have become accustomed through thousands of years to measure distances exclusively by dint of the denumerable order of cardinal numbers. But as long as we only count denumerable numbers we cannot obtain a proper concept of either Space or Motion because both phenomena involve actual Infinity.

How little we know about the basic structure of Space in general can be deduced from the most fantastic result Georg Cantor was forced to accept when he investigated the properties of real numbers. We learned in the preceding article that

$$c^2=c \qquad c=c \tag{1}$$

This formula certainly looks harmless. It seems to be trivial. But it contains ontological dynamite because it means that any line—finite as well as infinite—contains as many real points as the square over it. We shall skip the demonstration of this amazing relation between a one-dimensional line and a two-dimensional plane—which, incidentally, is done with the help of Cartesian coördinates—and proceed to the next formula

$$c^3=c^2 \;.\; c=c \tag{2}$$

Translated into ontological terms it says no more and no less than that the number of real points of the shortest line segment is numerically equivalent to the number of all real points in an infinite three-dimensional universe.

When Cantor in 1877–78 intended to publish this almost unbelievable result the editor of the mathematical periodical refused to print his article. It took the intervention of the mathematician K. Weierstrass, who had already obtained world-wide recognition for himself, to get Cantor's paper on the pages of the Journal*.

However, this is not all. We further know from our first article that

$$c^n=c \tag{3}$$

This means that all real points of any n-dimensional universe—where n is a finite number—are of the same numerical order as the number of all real points of our smallest line segment. And finally we have

$$c^{\aleph_0}=c \tag{4}$$

In plain words, the same relation would even hold if there were a universe with an infinite number of dimensions.

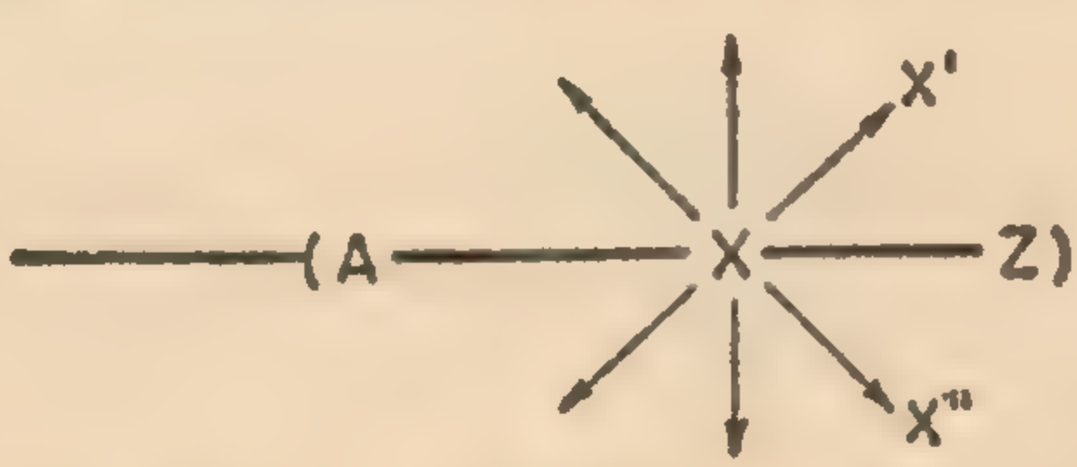
I am not going to discuss the far-reaching implications of the formulas (3) and

* Cf. Journal f.Math. vol. 84, pp. 242–252.1878.

(4) in this article. Formula (2) will suffice as far as our immediate problem is concerned. According to (2) it is possible to establish a one-to-one correspondence between the points of the smallest possible line segment and all spatial points of our three-dimensional universe. Our line segment has "as many" points as the entire metagalactic Space. Let us put it differently: *The non-denumerable order of transfinite c makes spatial dimensions and dist ınces disappear!* It should, however, be noted that the one-dimensional mapping of all space-points can only be done discontinuously. There is no continuous one-one relation between the points of a line and the points which establish the other two dimensions. That means, the transfinite system of real numbers provides us with a picture of Space which is allowed to shrink without limits. But by doing so it retains even in the form of a line segment certain characteristics which indicate that it is potentially much more than a one-dimensional sequence. The discontinuous character of the one-one relation between a simple line segment and Space hints at the possibility that our line may at any time—provided the necessary metrical conditions exist—"explode" into a three-dimensional spatial continuum.

As it is almost impossible to realize at the first reading the almost unbelievable consequences of formula (2) I shall try to outline them with a few words. First, as the shortest and the longest line segments are arbitrarily interchangeable—when measured in terms of transfinite numbers—it is metrically possible to arrive at any distance from any given point by traveling a negligible minimum length in terms of finite numbers. But the second consequence is even more fantastic. According to classical concepts of geometry one can only—traveling along a one-dimensional line—arrive at points which are located on this very line This limitation does not exist in realms where formula (2) is valid. If a finite line. segment represents transfinitely a three-dimensional continuum, then it must "contain" a transfinite number of points which are—spatially speaking—*not* located on the very same segment where we find them. This sounds like complete madness. But don't forget, if you had submitted the blueprints of a jet plane or of a television set to Moses, Alexander the Great, or Sitting Bull these gentlemen, too, would have decided that your drawings could be nothing else but the insane products of a hopelessly diseased mind. So let us face it, formula (2) implies that any line segment "contains" points which are not located on it.

Let us assume, we travel along a line AZ, and we permit the line at a certain location x to "explode" into a three-dimensional continuum—location x, if finite, contains all the points required for the "explosion"—then, instead of arriving at point X



we may arrive at point X′ or X″, neither of which is located on our line of travel.

It is hardly possible to overestimate the importance of these transfinite properties of Space for theory and practice of interstellar space-travel. We are

beginning to know nowadays that our present mathematical methods do not give us an adequate picture of the dimensional Space—and Time—properties of our universe. They describe at best the properties of Matter *in* our world, but not the principles of extension *per se*. Therefore, they fail completely when challenged to define the basic characteristics of the four-dimensional continuum of Space and Time in which our physical existence is embedded.

Zeno's paradox makes it obvious that our conventional ideas of distances and lengths are derived from our familiar knowledge of physical bodies. They apply to bodies, indeed, and generally to all verieties of material existence which has a quantized structure, but they do not apply to a different form of existence: the existence of the continua of Space and Time.

If Achilles could overtake the tortoise in our present world of Aleph naught—that is, if we could *think* the problem of motion by using our classical "geometrical" concept of distance, then the same concept would equally apply to interstellar distances. It is not probable that we would ever reach the stars under these circumstances. Because the idea of a journey that would take centuries even to reach our next neighbor, Proxima Centauri, is absurd. And how would galactic empires—the type Isaac Asimov has described in his Fountain novels—exist, if a message from one end of our galaxy to the other side of the rim took approximately one hundred thousand years?

But interstellar travel is, theoretically speaking, an undeniable certainty because the secret of motion is that it does not happen on the basis of quantized physical conditions where distances gradually pile up to almost immeasurable orders of magnitude. Everybody knows from his own practical experience that Achilles catches his animal—although the theory tells us that he cannot possibly do so. This is irrefutable proof that the quantized thinking of $\aleph_0$ does not apply to the problems of space. The continuum is of transfinite order, and here our traditional ideas about extension, about distance, and about dimension, become invalid, and have to be redefined.

Thus the impending Space age will force upon Man a revolution of thinking. I should like to quote several statements of John W. Campbell, Jr. which were contained in a letter (June 24, 1953) addressed to the present writer. We were discussing Cantor's theory of the transfinite Alephs, and our editor wrote:

"To date, I feel that no satisfactory correlation of Cantor's ideas with the real universe has been published.

"Some of the implications of Cantor's work are most disturbing to the mind orientated entirely on the quantized thinking implicit in two-valued logic, in a digital-ordered system of thinking, and in quantized physics . . .

"One of the things implicit in Cantor's work is that if any line contains Aleph n points, then if we accept the proposition 'Things equal to the same thing are equal to each other,' we must also accept that a line of any length is equal to a line of any other length! The concept 'greater than' as applied to line segments must then be examined.

"If, as Cantor's concepts imply, 'length' is a fiction derived from a limited operational method, the 'distance' between two points is purely a matter of measurement!

"It seems to me that there are many indications that the whole concept of

geometry is a special case of something far more general, in which Cantor's concept of Aleph-null becomes simply the first-order unit.

"And in that system, by recognizing that distance is purely a matter of operational method . . . why, the stars are as near as we wish them."

Please compare these remarks with the result of our preceding article on Achilles and the Tortoise. We learned that existence—and all existence is physical existence—can only be conceived in terms of quantized thinking, be measured with digital-ordered number systems, and objectively explained in quantized physics. But we also learned that all these methods fail if we want to tackle the problem of Space. The most striking indication of this failure is the existence of Cantor's formula:

$$c\aleph_0 = c \qquad (4)$$

according to which the smallest line segment has "as many" real points as there are in an infinite universe with an infinite number of dimensions. This elicits, of course, the question: How small is our line segment permitted to be? There is only one *logical* answer: As small as we can measure it? And how small can we measure it? This time there is only one *physical* answer: Down to the order of magnitude of one space-quant. We are, therefore, entitled to say that one single space-quant which is an absolute unit in terms of denumerable numbers contains as many points as any n-dimensional universe—where n is permitted to increase without limit.

Let us reformulate this most important result from a different aspect. It is implied by (4) that our technique of measuring by gradual accumulation of length-units is valid only when applied to *physical* states of existence. It is meaningless when applied to that which "*contains*" all physical existence, i.e. to empty Space *per se*. The concept of distance is meaningful only with regard to Substance in its two manifestations as matter and energy. It does not signify anything with regard to the voidness of Space. Talking in strictly physical terms we may, therefore, say: Space *per se* does not exist. But this is by no means all there is to it. We shall learn something more by having a look at the recent history of physics.

Newton still believed in an independent "physical" existence of the absolute voidness of Space *per se*. Famous is his experiment with a rotating pail of water. Everybody knows that if a pail rotates the water will assume a concave surface. This is the effect of a centrifugal "force" engendered by the rotation, and Newton interpreted this force as the result of motion relative to absolute or empty space. The validity of his argument was first doubted by Ernst Mach. But proof that Newton must be wrong was only obtained when Michelson and Morley performed their well-known "ether-drift" experiment and Einstein discovered its proper interpretation. If earth moves through absolute space, then the apparent velocity of light should be greater when the observer moves towards its point of emission, and smaller when he moves away from it. According to our classical conceptions this should be so, because in the first case one has to *add* the velocity of the observer to the speed of light, and in the second case the velocity of the observer must be *subtracted* as the light has to catch up with him. But when Michelson carried out his famous experiment no such change in the relative velocity of light was observed. No matter whether the observer moved towards the source

of light or away from it the velocity of light remained constant at 186284 miles per second (in vacuum).

Classically speaking, this is perfectly absurd. Let me illustrate it with a trivial example of our everyday life. We shall assume, there are two cars on the highway, both equipped with faultlessly registering speedometers. The first car is driven at a speed of exactly 60 mph. And the second car at 62. It stands to reason that the second driver will gradually overtake the first; and when he does so he will pull ahead with exactly 2mph relative to the first car. But the negative result of the "ether-drift" experiment suggests that the second driver would pass the first car with a speed margin of exactly 62 mph. "But that is impossible!" you will say. "If the relative speed of the two cars at the moment of overtaking is 62 mph, and the first does 60, then the second car should have an intrinsic roadspeed of 124 mph. It is impossible that the speedometer of second car indicates 62 mph. But in case it does, it is out of the question that the velocity of the two moving objects on our highway relative to each other is 62 mph. It is then exactly 2 mph." The argument is perfectly correct. The application of the Michelson-Morley experiment to our highway situation is nonsense. Because there *is* a highway, and both cars have two velocities—an "absolute" one with regard to the highway, and indicated by their respective speedometer readings, and a relative one with regard to each other. And their relative motion always depends on their "absolute" velocities. It can be calculated by a simple arithmetical procedure. In the case of an overtaking you subtract the smaller speed from the greater. If it is a collision of an overtaking you subtract the smaller speed from the greater. If it is a collision, you add the two speeds to each other.

But there is "no highway in the sky!" This was Einstein's solution when he tried to reconcile the negative result of the "ether-drift" experiment with our traditional conceptions of motion. Michelson expected a positive result for his experiment because he assumed that both, the light as well as its observer, would have an absolute velocity with regard to absolute Space (ether), and in absolute Time, in addition to their relative speeds. But the experiment was negative, and Einstein concluded that there was only one explanation for its result: absolute continua have no independent physical existence.

Einstein insisted that we should distinguish between Space and spatiality, and Time and temporality. Spatiality and temporality are basic *properties* of physical events. Absolute Space and Time, however, are mere theoretical abstractions without objective reality. It stands to reason that you cannot measure abstract concepts in terms of centimeters or seconds. On the other hand, spatial and temporal properties of physical objects or processes can be measured. And this by the way, is the scientific criterion of real existence. Nothing can be admitted as being objectively real in our Universe unless it can be measured either directly or indirectly.* But empty Space and eventless Time are not measurable. Their "properties" are always the same regardless of the speed or the position of the observer who is moving through them. To put it differently: It is impossible to measure distances in absolute Space or intervals of absolute Time.

As far as Time is concerned readers of science-fiction magazines are quite familiar with the relativity concept. Most of them know that, if we could travel around the whole "circumference" of the Universe in, say, a dozen years space-ship time, and we returned to Earth, billions of years would have elapsed in

* Cf. P. W. Bridgman. The Logic of Modern Physics. New York 1927.

terrestial time. But so far it has occurred only to a few that the distance Earth—Andromeda Nebula may be about two million light-years, measured in terms of terrestrial physics, but hardly anything, measured from a spaceship under proper space-travel conditions. This is at least theoretically possible, because distances in absolute space are nonexistent. Even more, it is meaningless to combine the idea of distance with that of empty Space—because relative to absolute Space the shortest imaginable and the longest imaginable distance are numerically equivalent. This result was previously implied by Cantor's formula: c+c+c+ . . . +c=c.

How about space travel now? I am afraid I shall have to postpone my answer to that fascinating problem till the final article, because one important link between the different parts of our puzzle of motion is still missing.

We have established that neither Time nor Space are absolute data of Reality. We are beginning to realize that the technique of interstellar and even intergalactic space travel will probably not be hampered by the consideration of millions of years and billions of parsecs. But the physical reality of our Universe is obviously a product of *three* basic components: Space, Time and—Matter. So far we have only heard about the relativity of spatial and temporal characteristics of our Universe, but nothing about its material component. Is there also a relativity of Matter, or is material existence the absolute and irreducible core of Reality?

My third and last article intends to show that Matter is as relative as Space and Time. And it is just this reciprocal relativity of Space, Time, and Matter which will enable us to understand that interstellar and intergalactic travel is not the product of the feverish fantsay of some science-fiction writers, but a theoretically well grounded implication of modern physical science.

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SUPERSTITION

By LESTER DEL REY

Superstition *is a dangerous thing; it's always extremely hard to fight. But nobody had ever had quite so hard a time with superstitions as these interstellar warriors—because the superstitions worked . . . and that made them* really *dangerous!*

Illustrated by Freas

I.

THE *Sépelora* crawled along at her maximum eighty light-years an hour, as she had done for the four months since she'd left the university planet of Terra. The space-denial generators hummed on monotonously, maintaining the field around the ship where space almost ceased to exist. There was a steady wash of slightly stale air through the control cabin, the big viewing panel remained an absolute mirror, and the pseudo-gravity on the decks was unvarying. With less than a day of superspeed left, Captain Derek should have been content.

Instead, he sat slumped loosely over the control board, staring with unfocused eyes at his image in the panel, while his fingers doodled black aces, hangman's knots, and all the other symbols of doom for which his culture had no real referents. His deep-set eyes and the hollows in his cheeks gave him an almost cadaverous look, borne out by the general angularity of his body. At forty-five he looked fifty, with gray speckles around his temples and lines of worry etched deeply into his face.

Abruptly a small speaker came to life with the voice of his aide, Ferad. "Psych Siryl to see you, sir."

Derek sighed, letting his eyes focus slowly as his fingers came up in the ancient sign against evil, pointing at his own image. The physicist, Kayel, must have sent her; the man had been eying Derek all during the orders for instrument alert. But now that she was here, there was nothing to be done about it. "Send her in," he acknowledged, and turned slowly to face the door that began opening.

Siryl's bearing was more military than his, in spite of her civilian blouse. Her feet tapped across the deck precisely, her hips swayed just enough in the split skirt, and her face bore the impersonal warmth of all psychologists on duty. Under her professional pride lay the curious overdeveloped consciousness of being female possible only to women who wanted to be men. She was ten years younger than Derek and only slightly shorter, but her features and body were good, as near beauty as grooming and care could make them. Only her hair was wrong, and its black severity was deliberate.

She wasted no time. Before he could rise, she was beside him, rolling back his sleeve. There was the coldness of an antiseptic and then the faint bite of a needle. "You'll be all right in a minute," she said coolly. "I'd have come sooner, but all these rumors have kept me busy. I've been expecting this; your chart shows you're a depressive with an irregular cycle." Her precise smile was calculated to make it seem no more than mention of a bit of common gossip. "Come on now, captain. Things aren't all black."

Now that the drug had ended his chance to wallow in the mood of his ill-fortune, he was almost glad. But her words touched it off again. The jinx was more than a mood. He was the only man of his age in the Service who rated less than Sector Commander. Everything he undertook went wrong, and seldom through his own failure. There had been the training ship that blew up, the girl who died from mutational weaknesses, the mislaid citation papers—and the whole affair leading to this foredoomed command.

"Optimism!" he said bitterly. "You should head an expedition that you know is bound to fail—because you head it!"

She snorted. "Superstition! Sure, you had a run of misfortune, Derek. But your real trouble came when you started to believe that jinx nonsense. You're so sure of bad luck now that it's sapped all your initiative. Look at you. You've been eying me for months, wanting me and being afraid to make a pass because something might go wrong!"

There was too much truth in it, and he could feel the blood rush to his face. She stood studying his reaction clinically, as if using it to gauge the progress of the antidepressant. Then suddenly she laughed easily and dropped to the opposite chair. "Maybe you should try sometime, Derek—but not now. I'm having my hands full with the men's rumors. Look, why not tell me the truth about this expedition? After all, we're almost ready to cut speed."

The drug was beginning to work now, killing some of his gloom. He was still convinced of his jinx, but he could think of other things. Now he considered her question, surprised that she hadn't already been briefed. "How much of the background and history of the war do they teach on Terra?" he asked. Some of the distant worlds had queer legends that would make explanation difficult.

She frowned impatiently for a second. Then she apparently decided to humor him and began sketching her knowledge in. Aside from her provincial belief

that men had originated on Terra, it was accurate enough. Wherever men had started, the race had seemingly discovered space travel two thousand years before and somehow had almost immediately stumbled onto some form of faster-than-light travel. They had spread over the cosmos at a fantastic rate, using up vast quantities of some power element known as uranium.

Thirteen hundred years ago, dwindling supplies of that had split them into two competing empires. An unthinkably violent war had blasted systems of suns to novas, had used the last of the uranium, and had left their culture in ruins. Except for misleading hints that it had involved negation of time, the superdrive had been lost. It had taken centuries to find new power in the fusion of boron. It had taken longer to discover how to eliminate space around the ship, leaving only a subfractional connection with the universe and using the "suction" resulting from imbalance to drive them. Then men began spreading again.

Fifty years ago, they had run into the other empire—an empire technically ahead of them and filled with hate that had been nursed for thirteen centuries. The enemy gave no quarter and began savagely wiping them out, planet by planet. For a time, the Federation had seemingly been doomed. But lately, under the drive of necessity, they had begun to match the enemy science. In a few more years—

"In a few years—or months—there won't be a Federation, unless this mission succeeds," he cut into her routine optimism. He fished around in a drawer to locate one of the mission briefing sheets he'd helped prepare. For a second, his lips twisted as he saw the dull, official words.

The *Waraok*, on its way to rendezvous with the Fifth Fleet, had cut its space-denial drive to make a fix in one of the old sun-blasted sectors at 9–17–2.47:23 Federation time. At 9–17–2.47:26 they were less than a quarter million miles from one of the planets of Sirius.

Something had thrown them more than two hundred thousand light-years instantaneously! And unless they could wipe out the enemy base or find the secret and its counter-secret, that something could easily throw boron bombs into every Federation sun! With that threat, even such hare-brained schemes as this mission had to be tried.

The *Sépelora* and eleven other ships were hastily stocked with every possible instrument, staffed with technicians, and blasted off on a course that would bring them out of superspeed at points around the recorded original fix of the *Waraok*. Their instruments would be recording and their space-denial transmitters signaling as they emerged, while a fleet of battleships followed. If they ran into the mysterious weapon and were lucky, the instruments might determine its nature. Otherwise, the locations of their last signals might pinpoint the enemy base for bombing. Then they could only hope it was an experimental station and the only one the enemy had.

Siryl had glanced over the paper. Now she crumpled it in sudden disgust. "They gave us this guff back on Terra! Derek, you don't expect me or the men to believe such nonsense? Instantaneous teleportation! Could *you* believe it?"

He stared at her, his first thrust of anger giving place to bitterness that drove away the last physical effects of the drug. "I could be able to," he told her. "I was captain of the *Waraok* when it happened!"

It had been his first command of a battleship—and his last chance at promotion; the loss of plans he had been carrying had cost the Federation a major

defeat, even though it had been no fault of his. Such miracles weren't beyond the power of his jinx.

She snorted incredulously. "Captain, even I know that a single photon would have infinite energy against a ship at infinite speed! You couldn't keep it out without a perfect space-denial—which means ceasing to exist. This story sounds like something from those papers of Aevan's we found. A fine mathematician from before the Collapse, but superstitious like you. He actually believed in mind-reading, clairvoyance and teleportation!"

Legends indicated that people had once had such abilities to some extent, but there was obviously no use in reminding her of that. He swore hotly. "I tell you, I was there!"

"Hypnotic implantation! Propaganda based on old superstition! You'd better look in your safe for sealed orders, Captain Der—"

Red lights erupted on the control board. The alarm system went wild, with every gong clamoring. A blare of light struck in through the viewing panel and the big radar let out a whine, with a picture and coördinates forming to show a body of planetary size less than ten thousand miles below. Needlessly, the green letters on the board blazed out the fact that the superdrive was off.

Derek silenced the gongs and began hitting his switches, trying to get information. Nobody answered. Crews were normally lax during superspeed cruising, but at least one man should have been on watch near the space-denial generators; the others should be reporting to their stations on the double. He cut into the intercom and began yelling for immediate reports.

The door of the cabin jerked open, but it was only the chubby figure of Ferad, scared white. Then another figure burst through the door, and Derek recognized the physicist, Kayel. The little man's weak chin seemed buried in his throat and his huge Adam's apple was bobbing horribly. He jerked one hand up, clutched around a crooked pipe he affected, and motioned tautly backwards. "Gone!" he screamed. "All gone!"

Derek cursed, shoved him aside, and headed through the door. He leaped across the precabin, yanked another door open—and stopped.

Five feet ahead, the deck ended. Where the cabins, storage hatches, rec rooms, galleys and parts of the machine shops and engine rooms had been, there was nothing! Or rather, there was only a single kêri-bird from Sirius, squawking and beating its wings wildly in air that held the warm, wet scent of growing Sirian flowers!

Beside him, Derek heard a sharp gasp from Siryl and felt her fingers bite into his arm. Ferad stood frozen and Kayel was gasping for breath, trying to light his pipe against chattering teeth. He met Derek's gaze, glanced at Siryl, and somehow steadied himself.

"It . . . it just went! I was back there—" His finger pointed toward the remains of the engine room and the beginning of the rocket chambers. "Gone! Without cutting the hull! Completely impossible!"

Derek could appreciate their shock, but after years of living with his jinx, he was practically immune. There were advantages to everything, even to regular bad luck. "What about the denial drive? Can we fix it?"

"No." Kayel had hesitated, but his negative was definite. "Most of it's all right, but we'd need tools we don't have now."

Derek nodded. "All right, see what our remaining instruments show; if we get back, the Federation will need those readings. Ferad, get back to the rockets. Somehow, we've got to make a landing on that planet under us. And Siryl, if you're done shouting superstition at me—"

Then he stopped. She was staring at the yawning emptiness with unbelieving eyes.

Eighty men and tons of ship were gone, with only a Sirian bird and the perfume of flowers in their place. Among the missing were the pilot, navigator, and engineer. Derek hadn't handled a rocket landing for twenty years, and he didn't even have figures on the atmosphere and gravity of the world below. He groaned to himself as he headed back to the control cabin.

II.

The planet was closer when Kayel reported back with word that the instruments all showed exactly nothing. He was working with the spectroprobe, trying to get data for Derek, when Siryl came in with coffee as a peace offering. "Some of the supplies are all right," she reported. "Enough for . . . for four!"

"Thanks." Derek tasted the coffee and found it vile. But at least it was hot and wet. "Better take some back to Ferad if you can find the way. Tell him if he doesn't report at once, I'll skin his fat carcass."

Kayel gulped and accepted coffee from her as if he'd never seen a woman serve food before. He probably hadn't on Terra, judging by what she'd done to the coffee.

Derek interrupted the physicist's stumbling compliments. "Find anything yet, Kayel?"

Siryl threw him a dirty look and went out, again on parade drill. Kayel nodded, turning back reluctantly. "One of the blasted systems, all right, sir. Spectrum looks as if the sun got a light dose, though."

Probably one of the last suns the first war had ruined, Derek thought; men had been running low on high-numbered atoms by then. If the blast had been mild, it might even have missed the planet. In that case, they might find machinery in some of the ruined cities.

Kayel shook his head. "Planet was hit, all right. A lot of helium in the atmosphere shows that. Funny, though. A couple hundred miles of air with plenty of free oxygen—about like Terra." He sucked on his pipe, squinting through heavy lenses at the charts he had prepared. "Um-m-m. Density against height—must have about gravity one. Damn. Shouldn't be free oxygen in that quantity!"

Derek muttered unhappily. The *Sépelora* wasn't equipped with full-sized vanes, and an atmosphere and high gravity would make landing harder. Still, if they got down it would be handy. And while the ancient solar explosion would have ruined their hope for tools, it meant there was no danger from savages or beasts left over from the old days; some of the distant worlds had turned wild.

Ferad reported finally, complaining at the impossible job of readying the rockets by himself.

"Put Siryl to work with you," Derek ordered. "They'll be ready in five minutes or we'll miss perigee."

Their intrinsic momentum, left from their speed before cutting on the space-denial generators after take-off, was carrying them down toward the planet in an ellipse that would approach within some six hundred miles.

Surprisingly, Ferad reported the rockets ready and valves trimmed within the time limit. The ship groaned as the rockets went on and Derek watched his indicators grimly, expecting the worst. With so much of her interior bracing removed, she was badly weakened and completely unbalanced. With his luck, anything could happen. Usually, he managed to get out of one mess before getting into another, but there had been that time during inspection—

The *Sépelora* hit the atmosphere badly. There had been no time for full correction with the side rockets, and the gyroscopes were gone with the missing section. One of the weakened girders let go with a snap that jarred his teeth and the ship wobbled before straightening out. Derek knocked the sweat out of his eyes and tried to remember all that he'd been taught back in rocketry school. But all that came back was the instructor's long lecture on why accident prones should be kicked out at once.

The ship righted, however, though it was close, and settled into a long, fast glide, with her hull pyrometers well into the red-hot zone but safe. A protective shield had slipped over the viewing panel, but the radar still gave them a view of the ground. They came down to twenty miles above the surface, then to fifteen.

Kayel let out a surprised whinny and pointed the stem of his pipe excitedly at the screen. Derek could see nothing, but the little man watched intently as something seemed to vanish. "A city! Straight lines—streets!"

"Ruins, probably," Derek commented. Maybe they were in luck and the solar explosion had only touched the planet, without burning it enough to destroy buildings and major tools. After thirteen hundred years, some would be ruined; but the ancients had built things to last on the outer planets.

There was a thin layer of clouds that the ship cut through. Now the going was rougher. Without full vanes, the *Sépelora* had all the lift of a stone and the glide was growing steeper asymptotically, though her temperature was finally dropping. Derek got her tail down and began using controlled blasts.

Three miles above the surface, she was falling almost straight down, going too fast and swaying badly. Correcting for the unbalanced weight was harder than he had expected.

Then he was only a mile up. With a groan, he cut on more power, hoping no other girders snapped. It was going to be a close shave, with scant seconds left.

Kayel jerked up, screaming and pointing to the screen. Derek's eyes followed the motion before he could pull them back. Something that might have been rows of buildings showed there. But he couldn't worry about ruins; the blast would flatten them, anyhow.

"Derek! People! They're moving!" Kayel's voice was screeching in his ears.

He thrust the obvious hysteria of the other from his thoughts. The last glance had ruined his timing. Now the surface was zooming up. The *Sépelora* wobbled, overshot, and then slowly came upright. Derek's eyes jerked to catch a quick glimpse of the screen. For a second, his hands froze. Along the regular rows that must be streets, things were scurrying madly out of his path!

There was no time to think. Conditioning against killing others, no matter what the risk, took over. His fingers bit into the side controls, and the *Sépelora* twisted under him, beginning to topple. For a second, the full side blasts tossed the ship backwards. Then she dropped, just as he cut power in a final conditioned reflex.

Kayel had fainted. Derek stared at him and down at his own hands. The ship was still. There had been no shock. He tried to figure it out; in theory, the various forces could counterbalance to cause a dead halt at just the moment of touching surface. But the chances were so remote that no pilot could have estimated them. It was as if all the years of his incredibly consistent jinx had come to a balance in one impossible piece of blind good luck.

Kayel came to slowly, blinking. His fingers groped up to find his glasses still on his nose. "My pipe!" he squeaked, and ducked down for it. Then he straightened, staring at Derek. "We're alive!"

"No thanks to you," Derek said curtly. He flipped a switch and the shield over the viewing panel began sliding up, just as Siryl and Ferad came in. They looked exhausted, but less shaken than Kayel—probably because they hadn't known what was going on. "Don't start cheering yet. There are people here—and there shouldn't be on any sun-grazed planet we haven't recolonized. With my luck, I've probably landed us right in the middle of an enemy colony!"

"Luck!" Siryl snorted. "The enemy are compulsive troglodytes—they don't build surface dwellings. And look at that."

The shield had come up enough to show fields around them, apparently corn and potatoes. Beyond, the edge of the town could be seen, built in low structures of crude stone and thatching.

"An agricultural culture," Siryl guessed quickly. "Look—there's one! See, coming through the field. We're in luck. Primitive agricultural societies are usually peaceful."

Several people were filing toward the ship, showing no sign of fear. They were dressed in rough pants with serapes or blankets thrown over their shoulders. The men wore beards with hair to their shoulders, all of a uniform brown except for the graybeard in front. The women were distinguished only by thick plaits around their heads. They were a healthy looking bunch.

The graybeard moved to the viewing panel, waving at them with some bit of what seemed to be stone in his hand. His motions indicated that they were to come out.

Derek shrugged faintly and nodded. He headed toward the door.

Siryl caught his arm. "Where are you going?"

"Out. You said they were peaceful."

"Usually peaceful," she qualified hastily. "But—"

"Unless they're superstitious about sky devils, eh? I'm still going out." He headed down the nearest passage that would lead to a lock. There was nothing else to do. Their few weapons were gone, along with their tools and the big space-decoupled signaling transmitter. The *Sépelora* was only a converted freighter and her hull was too thin to withstand any concerted attack by even primitive agriculturists. If the worst had to happen, it was better to get it over with at once.

Siryl hesitated for a second. Then her heels tapped out a steady pace behind him, while the other two followed reluctantly. She caught up with Derek and marched beside him. If she were afraid, there was no sign of it.

He opened the inner lock, then the outer, and dropped to the field of stubble. As he landed, the graybeard came around the curve of the ship.

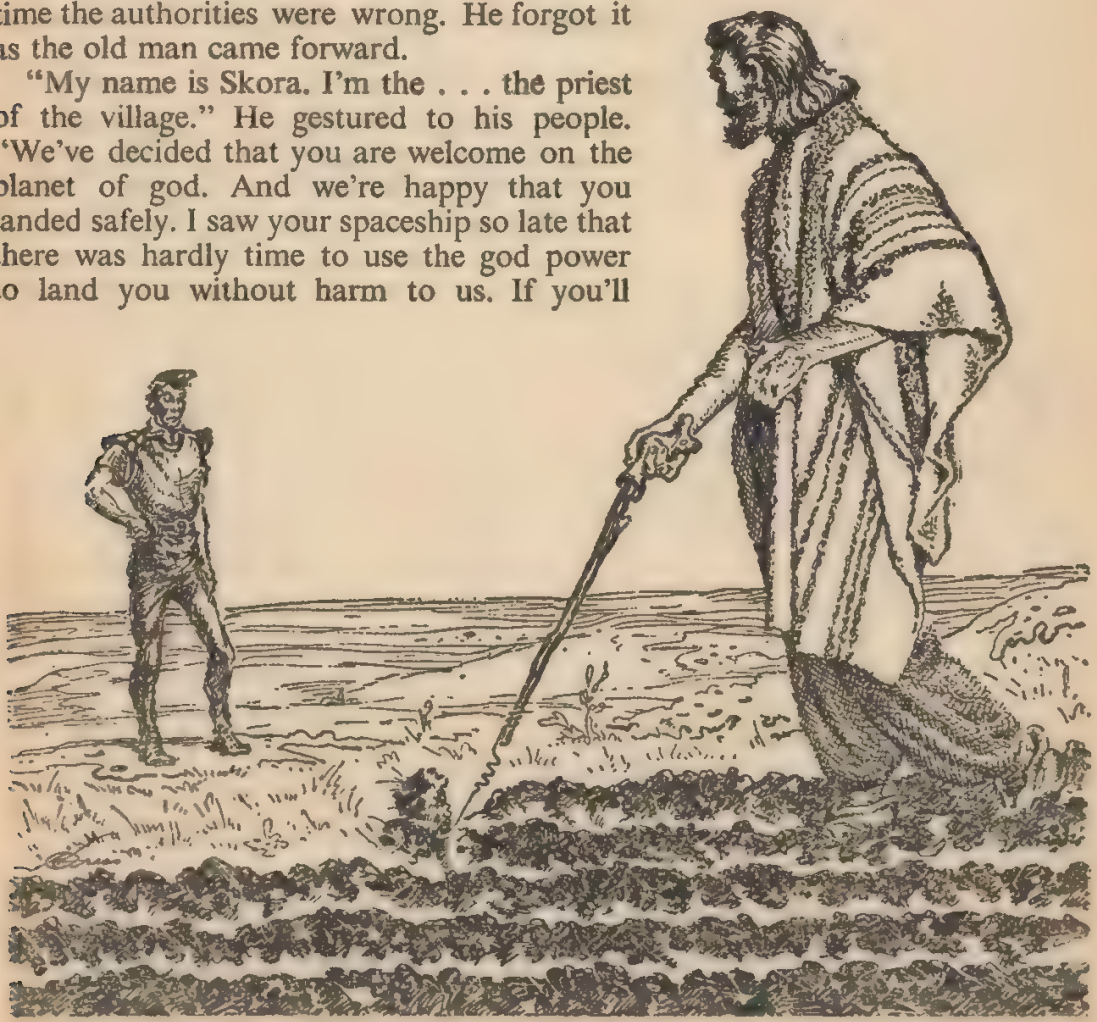
The old man's lips parted in what might have been a smile, and words came out, slowly at first, then more rapidly in the classic greetings of Twenty-fifth Century English.

When the words finally ceased, Derek stepped forward and began a careful reply. Classic English was the basic language from which that of his own planet had been derived, and he'd studied it during eight long years of schooling, without ever expecting to use it.

The graybeard turned back to his people and stood silently for a minute, glancing sideways at the four. Siryl was staring at Derek in surprise. "I did a paper on Aevan's work," she said, "so I had to learn Classic. That's the pure language, unchanged after thirteen hundred years! And primitive cultures don't preserve dead languages—speech changes from century to century."

Derek shrugged. She knew a lot of things with the certainty of the teachers who had taught her. It wouldn't be the first time the authorities were wrong. He forgot it as the old man came forward.

"My name is Skora. I'm the . . . the priest of the village." He gestured to his people. "We've decided that you are welcome on the planet of god. And we're happy that you landed safely. I saw your spaceship so late that there was hardly time to use the god power to land you without harm to us. If you'll



walk back with us, there will be shelter and warmth. The nights are quite cold here."

Derek turned the offer over in his mind. He'd have preferred to stay with the ship, but wisdom dictated otherwise. "That's kind of you. We're much obliged." He was proud of remembering the phrase.

The old man nodded, while his eyes examined the others. A smile etched his face as he spotted Ferad's hungry looks at one of the younger women. "She's unmarried," he said. "Tell him she likes him! She shall be his!"

Siryl translated quickly. "Accept!" she urged, though Ferad's fat face indicated no need of such advice. "You'll insult them otherwise. Derek, I *was* right. They're primitives—hospitable, provincial, superstitious. Did you notice how he called this *the* planet of god? And how he thinks he landed you with some incantation?"

Derek grunted something she took for assent. Let the old man have full credit; prayer or magic was as good an explanation as any other. He studied the quiet group as they moved toward the village.

"Maybe," he said, "but I'd like to know how your primitives knew about spaceships and safe landings! And I'm curious about how he knew we had to translate the language for Ferad when both of us were pretty fluent in it. Another thing—he said the nights are cold *here*, as if he knew they aren't on all the planets."

For once, she was as silent as the natives. Derek had been hoping she'd have an answer, and her silence added to his doubts. Something was out of order on Skora's planet of god!

III.

The house assigned to them had proved surprisingly comfortable after they learned to work the peat-burning fireplace. The food had been passable, if a man liked cereals and mutton. Derek had gone to sleep readily enough, to his surprise. But dawn had found him awake. No attempt was made to stop him as he walked out of the village, past the undisturbed *Sépelora*, and on to the low hills beyond the tilled land. Siryl was apparently right in assuming they were safe, once bread had been broken.

But his uncertainty returned as he studied the view from the top of the nearest hill. The solar explosion had hit hard at one time; the ground was ashy in places and actually melted to slag in others. A few plants grew here and there, but thinned out in the distance, indicating they had spread from the village. There were no trees anywhere. By all indications, rainfall must be infrequent and light. The village seemed like a bit of another world, transplanted into the wasteland.

From the top of another hill Derek spotted what must be a second village, perhaps four miles away, again green and thriving. He stared about for a road between the two towns. No path led out of either.

Men were already in the fields as he returned. Some stood quietly watching their sheep and goats; others were puttering about in ways he couldn't understand. There was none of the grimness he'd always associated with living off the ground on backward planets.

Beside the field where the *Sépelora* had landed, Derek saw a young man

pushing a stick along the ground, leaving a furrow of turned earth behind. There was no sign of a plowshare, aside from a piece of bent wire, and the man was using only his own muscular power, but he was obviously plowing. From his effortless motion, he was either inhumanly strong or the ground was incredibly soft. Derek reached over for a handful of dirt, but it seemed normal enough.

"Good morning, Derek. I'm Michla." The plowman had stopped and walked over, leaving the stick standing. He took some of the dirt and rubbed it between his palms. "Too dry. I'll have to bring some rain tonight."

Derek shook his hand, finding it no stronger than that of any normal man. "Glad to know you, Michla. I've been wondering how your plow works."

"See for yourself." Michla led the way to it, pulling the implement up. It was only what Derek had seen—a stick with a bit of bent wire and a curiously shaped handle made of baked clay and covered with curlicues. "I hold the amulet and guide it. God turns over the dirt. It hasn't changed since god showed us how to farm."

Derek could see no sign of the burrowing machine that must be located below the ground, guided by a signal from the stick. He frowned, reluctantly deciding that it was safer to accept the explanation until he could learn more about their customs. "This god you worship seems like a highly helpful one," he commented.

"Worship?" Michla shook his head. "Nobody does that, Derek. We know he was only a man like you or me—and sometimes I think he was always a little insane. By the way, I'm planning to plow the other field. Mind if I move your ship?"

The ship's controls were locked and there was nothing the man could do to hurt it, Derek decided. He'd have to see about moving it himself, if there was fuel enough to waste. Meantime, it might be a good idea to let Michla find that other people had secrets and that ships didn't fly by waving wands at them. "Go ahead."

He headed back to the house they had been given with Lari, the new wife of Ferad. Here and there, one of the villagers looked up and uttered one of the old greetings, which he returned. It was the only conversation he heard. They saluted each other just as formally, but with no further talk.

Ferad was waiting hungrily for breakfast and Lari was busy setting a stone table when Derek returned. She smiled happily at him. "Good morning, Derek. Breakfast will be ready as soon as the fruit god showed us arrives. If you want to shave first, Skora brought up one of god's personal razors."

He stared after Lari's figure as she went back to the kitchen. This lower-case god of theirs was getting to be a highly peculiar divinity. Derek went to the well-fitted bathroom in the rear, wondering where they got their water; each house had a tank on its roof, but there were no supply pipes. He found a razor that might have come from a pre-Collapse museum, lathered with a cake of their somewhat harsh soap, and tried it out. It worked well enough, once he got the hang of it.

Kayel was standing in front of Siryl's door as Derek left the bathroom. He blushed, bit down on his pipe stem, and hurried toward the living quarters when he saw the captain.

Derek knocked lightly on Syril's door and threw it open. "Come on to breakfast!"

She opened sleepy eyes. Then she screamed and began pulling frantically at the blanket, trying to cover herself as if her life depended on it. Her face went white, and her voice was a thick gasp. "How dare you—?"

"Somebody had to wake you up," he pointed out logically.

Her face crimsoned, whitened again, and hardened slowly. "I resent your invasion of my privacy. How would you like it if I barged into your room like that?"

"Try it!" he suggested, grinning at her. "And don't count too much on my fear of failure."

"Maybe I will, captain. That overdose of anti-depressant I gave you won't last forever."

He growled and turned toward the living quarters. It was a fine crew he had left! He'd heard once that since the Collapse all men were neurotic in some way, while psychiatry had turned from a science to a farce. They bore out the theory. Kayel had an Oedipus complex, Ferad had turned to gluttony and hidden a good brain to avoid responsibility, and Siryl walled herself in with scorn for all men because she couldn't be one! Maybe their whole civilization was at fault. The people of the village had seemed as relaxed as if they'd just finished a course in electro-leucotomy that somehow left them with no loss of volition.

Derek found a seat at the table and watched Siryl slide in beside Kayel, who tried to hide his excitement at the favor behind a labored puffing at his pipe. Skora had joined them and was seated near Ferad. He had been explaining something about one of the students at the school having trouble with something god had revealed to him. Now the old man smiled and reached toward a bowl of fruit in the center of the table.

"I've never thought of eating fruit, but I decided to try it," he said. "I hope it's good. When I found from god that most of the worlds like more than simple cereals for breakfast, I tried to find the type of fruit that was best."

Derek began peeling one of the big fruits, wondering how much of that he was supposed to believe. The marel-fruit grew only on Feneris, where its export was the chief industry. He tasted the aromatic sweetness, surprised to find it fresh and fully ripe.

"It must be at least a hundred thousand light-years to Feneris," he suggested, trying to keep his voice casual.

Skora nibbled carefully. A smile of pleasure appeared on his lips and he fell to busily. "Good. Excellent. We'll have to adopt this. Feneris? It's farther than that. But the fruit grew on many worlds before the sun blasting, and still grows on a few in this sector. We found from god where to get it and sent one of the boys who needed the exercise."

"Then you have spaceships!" Derek's fruit fell to his lap as he came to his feet, his hands gripping the edge of the table. If it came from another planet of this system, it might not mean they had faster than light travel, but still—

Skora shrugged apologetically. "I'm afraid not, Derek. Vanir is a simple world. We have only our god and his power. The work of building spaceships has always seemed too great for its reward. You'll find us quite primitive from your views, I'm sure."

"But—"

Siryl cut in, using Universal. "Stop it, Derek! Don't violate any verbal taboos here, if you want to get out alive!"

"But he knew the distance to Feneris and about other planets!"

"Folk songs and sagas!" She switched back to Classic, apologizing to Skora.

Derek let it drop, but he wasn't satisfied. The marelfruit grew only in a saturated atmosphere which this planet didn't have. This might not be a colony of the enemy or have its own spaceships, but that was no proof that ships couldn't stop here—enemy ships. With his luck, anything odd would almost certainly prove to be dangerous. He chewed on it bitterly, along with the pancakes Lari brought them.

This god of theirs might even be one of the enemy, using some strange technology to create near-miracles that the villagers could only believe were magic. In that case, word must be winging back to the enemy planets of their capture. It would be only a matter of time before one of the squat black ships landed here!

Derek got up abruptly, making hasty excuses and signaling for Kayel to follow. This was no time to waste on speculation. The ship was their only means of escape, and it had to be put in some kind of operating condition.

Siryl followed them as Derek voiced his suspicions to Kayel. The little man's eyes bulged and his face turned ashen as the captain poured out his doubts. But she snorted in disgust.

"Stop exercising your persecution complex!" she snapped. She shook her head, putting on her superior smile of tolerance. "You men! A few things you can't understand and probably some changes in the language we haven't caught yet, and you picture bogey-men under every rock! There isn't a trace of inferiority feeling here as there would be if they'd run into a superior culture!"

Ahead of them lay the ship, and Derek saw a figure standing beside it. He broke into a faster walk, until he recognized it as Michla. The man waved at them and went back to whatever he was doing. As they came nearer, Derek saw that he was running his fingers over a large, odd-shaped stone plate with more of the curlicues on it.

"Incantations on a charm. He's probably sure the ship is a form of life that can be commanded with the right spell," Siryl said with satisfaction.

Michla pulled the disk to him, holding it against his chest with one hand. The other hand went out to touch the side of the ship.

As he lifted his arm, the twenty thousand tons of the *Sépelora* lifted a foot off the ground and began moving steadily forward beside him. He carried it along easily, heading toward a section of wasteland half a mile away.

IV.

By the time they reached the *Sépelora*, Michla had picked up his strange plow and was busy at the far end of the field. Derek fumbled his way into the ship and began switching on the strain gauges while Kayel watched. There was no evidence of harm.

"Antigravity!" The physicist's voice was an awed whisper. "I always thought it was impossible with less than tons of equipment! And generated in the whole of the ship at once!"

Derek swung to face Siryl, but she was recovering and there was no humility in her. "Hypnotism, you mean! They must have worked on us while we slept and made us think the ship was in the other field, when it was here all along. We even saw it there and being moved, by post-hypnotic suggestion. Lots of primitives have some knowledge of hypnotism."

"Make it magic and I'll buy it," Derek told her. "That's a good explanation for what you can't understand, too."

She started to say something and then checked it. Finally she turned toward the air lock. "All right. Let them fool you. I'm going to go back to Lari. Primitive women are always easier to handle than their men. They're less organized,"

She went out and through the fields, carefully avoiding the sight of the depression where the *Sépelora* had first lain. Derek and Kayel fell to work on the ruined space-denial generators and what stores were left to them.

By all standard methods, it was hopeless. Yet Kayel began sketching and checking among the small power tools. He seemed to gather momentun, now passing orders to Derek with a certainty that showed only when working in his own field. "It won't be good," he admitted. "I'm having to compromise. But I think we may be able to combine enough of some of the new theories with the first methods ever used. We won't make better than fifteen light-years an hour, but it should get us to one of the border planets."

It was meaningless to Derek. But if they could leave, he was willing to try it. They worked on, grinding and shaping by methods that had been lost from practice for over a century. Some of the work would be trial and error, with no chance to estimate the time it would take. But it helped to take their minds off the primitives who could handle forces civilized science couldn't touch.

Ferad came out finally to call them to dinner. It was already growing dark, and there was fine rain falling. Derek stared up through it. He had looked out fifteen minutes before and had seen no clouds in the sky. There still were none he could see, but the water dropped at an increasing rate as they moved out of the wasteland onto the cultivated fields. In the village, the covers of the water tanks were off. Derek wasn't surprised to see that the rain poured down more heavily over the tanks.

Apparently Siryl had been checking on the rain with Lari. As they entered the house the native girl was running busily from the kitchen to the table, but she was keeping up a steady fire of conversation

"Of course Skora brings the water at night. It's better after all the work in the fields is done," she explained. "Though sometimes there's a light fall of natural rain in the daytime. That makes us all feel good. When we first started, we had to import all our water. And now we have two small oceans. Of course, god told us the planet had eight big ones before the sun exploded. I was asking Skora about it, and he says some of the worlds are all covered with water—not even a little bit of land."

Siryl's face showed that she had learned nothing—or at least nothing that she wanted to know.

Lari came hurrying back, carrying a huge metal pot of stew to the table. She held it at arm's length easily, and Derek noticed one of the amulets in her hand—this time a small one with only a few simple marks on it. He pointed. "What's that, Lari?"

"A lifting tool. God showed us how to make all kinds of tools. There's one

that eats away the rock, and one that plows the ground—you saw that, didn't you? Skora bakes them. They make god work for us. Come on, dinner's ready."

Derek picked up the little piece and turned it over. It was a twisted lump of clay, baked hard, with a series of marks on the top. It looked as if no design existed, yet there was a certain flow to the lines. He reached out for the kettle, fingering the amulet. If the kettle weighed less because of it, he couldn't feel the difference. Nor could he find any sign of a switch buried on the surface of the gadget.

If there was some kind of broadcast power here, and these things were receivers tuned to convert it into special functions—

He pocketed it while Lari's back was turned. There might be some penalty for the theft of one, but he had to risk it.

The next day when they reached the ship Kayel took it to pieces bit by bit. Lari had missed it, but had only shrugged and pulled another out of a drawer.

The piece of clay grew smaller and smaller under the grinder as Kayel worked on it. At last it was just a nub that he had to hold with pliers. Then even that was gone. On the floor was a pile of dust, with no trace of metal or foreign element in it. The two men stared at it sickly and then dropped the matter quickly as they turned back to the labor of rebuilding the damaged space-denial generators.

They worked on doggedly for three days more. Ferad had flatly refused to help them, claiming his marriage to Lari made him a citizen of Vanir and had ended his need to work under Derek. It was a point the captain had no desire to test while his knowledge of things was so uncertain. Maybe Ferad was a citizen now, and any force exerted on him would antagonize the whole village.

It was hopelessly slow going, but they were making more progress than Siryl. She finally admitted that she was getting nowhere. There was one explanation for everything—and that was their god.

"They're the most superstition-ridden race I've ever heard of," she concluded in disgust.

Derek had his doubts. So far, every bit of superstition he had run into had proved sound empirical sense. It didn't matter whether they called it god, or magic, or anything else. It worked. And they were no worse than many of the civilized people who used the tools given to them and had no other explanation than the fact that science somehow made them work.

If men lived on a world where the only cats were leopards, where black leopards were all man-eaters, and where the cats avoided men unless looking for food, it would be extremely bad luck to have a black cat cross one's path. In such a case, the only superstition would be a denial of the facts and a belief that there had to be some other explanation of why men had disappeared.

Siryl's faith in hypnosis and primitive ignorance might be the real superstition here. Belief in a god and the tools probably wasn't.

He went out into the rain that was falling again, looking for the house of Skora. There were a few people around and he recognized one as Wolm, the brother of Lari. The man directed him toward a house that was somewhat bigger than the others, with stone work that seemed to have mellowed with time. Derek had passed it before, when a group of children from six to nine were seated silently on couches across an open porch, and had been told it was the school where they learned god's knowledge. He should have guessed that the priest would handle the schooling here.

Skora emerged from an out building that boasted the huge chimney of a kiln and invited Derek in. The walls of the building were lined with amulets of all kinds and sizes, and there was a big workbench along one wall that was covered with tools for shaping clay. It was obviously the source of the amulets.

Derek went through the formula of greeting and accepted a bottle of surprisingly good beer.

"I'm getting ready for a new baking," the priest said. "This village has to supply some of the smaller places with tools. My usual helper married into another village. Why don't you and Kayel join me? It beats farming, and I understand your friend knows a good deal of science. Maybe he can show us better methods of making the tools."

"He isn't exactly a ceramicist, but we'll think about it," the captain promised. He had been turning over every indirect approach to his question. Now he discarded subterfuge. In spite of Siryl's warnings, the only way to learn anything here was to risk stepping on their taboos. "Skora, I came here to ask about your god."

Skosa put aside the molds he had been cleaning and perched on the edge of the workbench. "That's asking a lot," he said, but there was no offense in his voice. "It takes our children several years to learn all about him, though we've speeded things up in the last couple of centuries. And there are some things I can't tell you properly, for your own good, though I'll be as honest as I can. Um-m-m. He's a man—a very wise and very stupid man. He saved us after the sun was exploded in the great war and taught us how to survive. He still teaches our young children."

Thirteen hundred years had passed since the solar explosion. Derek whistled. "He sounds like a pretty remarkable man, Skora. No other man has found the secret of immortality. Or do you mean that he dies, but a new god replaces the old one each time?"

"Neither one. No man is immortal. And there is only one god. Sometimes I used to wonder about him when I first learned to use the power. I even thought of investigating, of going to see him. But I was always too busy."

Derek could see no evidence of deceit on Skora's face, and there was no way he could twist the words to make them mean anything but an impossible contradiction. "Suppose *I* wanted to visit your god, Skora—could I talk to him?"

The priest laughed and dropped off the bench to fetch two fresh bottles of beer. "You'd have a hard time of it, Derek. God died over a hundred years ago."

"Then when you say god helps you, I suppose you mean that you still follow his advice, using what he taught you before he died. Is that right?"

"Not exactly. Partly, I suppose. Tradition kept the use of the tools under the false, emotional label of prayer for hundreds of years, before we could root it out. I suppose we still use some of the terms in ways that aren't literally true." The priest shrugged. "But we still need his help when some new problem comes up. We couldn't have found where the fruit grows in time without asking him. And he still teaches the children directly."

"But he's dead?"

"Quite dead," Skora assured Derek. "Sometimes I think we're headed for trouble because of that, and it makes things a little difficult at times. But what's a little trouble? When I first had to bring rain, it took all my thought to control

it. Now I can sit here talking to you and enjoying myself, without losing control of the tool."

He pulled his hand out of a pocket and showed a quartz amulet in his palm, where his fingers had been fondling it. "When I was younger, I had trouble enough without any distractions. Once I forgot to remove only pure water and nearly ruined the crops with natural sea water. The planet where the rain comes from has a lot of copper salts, and that doesn't help the land."

Derek stared at the priest with sudden shock, the bottle still tilted to his lips. He forgot to swallow and gagged as beer ran down his throat and into his windpipe.

It was the complete logic of it that hit him. The rain had to be controlled, since it fell most heavily where it was most needed. Lari had already told them that the planet here had been almost barren of water after the solar explosion. Water didn't create itself. It had to be brought from somewhere.

He coughed up the beer, forcing some measure of calmness into his mind. The pieces began to fit, even though there was still no explanation.

They could draw water across space, without letting it freeze or evaporate—or even grow chilled in its passage. The only answer to that had to be some form of nearly instantaneous teleportation!

"You!" he said thickly. "Your people! It was you who threw my *Waraok* all the way to Sirius. And you were the ones who threw part of the *Sépelora* somewhere else this time!"

Skora nodded. "That was a mistake. When I learned about your ship and the others with it, I'd never worked through a space-denial field, and had little time in which to operate. Yours was the first ship I tried, and I bungled it. But no harm was done. I put your crew on a livable planet and set the other ships beside them—the battleships, too. Working with a tool which wasn't made for just that use was quite tiring, or I'd have landed you with the others, instead of letting you nearly crack up here. After you saw us, it was too late to move you, of course. I'm sorry, Derek, but we had to do it that way."

The bottle dropped to the fioor and smashed as Derek stared at the old man. He should have guessed. With his type of luck, it was inevitable. He'd chased out after the enemy and been caught—by this! He staggered to his feet with shock waves of pure fear rippling through his shoulders and chest. One man against a whole flight of ships! One solitary old man—

V.

His memory was unclear the next morning. He'd been nearly raving when he'd sworn and pleaded with Skora to send them back. He could remember being denied by the suddenly worried and unhappy old man, but the reasons were no longer clear. All that was left was a picture of the priest putting his rain-making amulet aside and pulling down another, before taking Derek's arms in firm, strong hands.

"You're sick," Skora had said. "I had no idea. I should have known you weren't ready to discover the truth. Well, I hope your psychologist is a better doctor than healer of minds!"

And suddenly, Derek had been in his own bed here, with his clothes following

him out of nowhere to drape themselves over a chair. The covers had come up over him and the door had opened itself. He had been shouting something. Siryl had come in a few seconds later and there had been a shot of some drug—

He gave up trying to remember, knowing it was safer not to think on it now. He had been too close to insanity. After all the years of fighting against the jinx, he had developed more strength than most of his people, but there were limits. Maybe he should have let them drive him insane! What was the use—

The door opened and Siryl came in, carrying another hypo. She grabbed his arm and he felt the bite of a needle. For a moment, his heart pounded and cold sweat popped out all over him. Then some of the misery lifted. Whatever she had used the night before must have been a depressant that had needed counteracting.

"Pull the covers up! Have you no sense of shame?"

"No strength. You pull them up." The drug was nearing the end of its first physical impact, but he could barely talk.

She made a face of disgust as she bent slowly and forced herself to cover him, carefully avoiding all contact with his body. She winced as he laughed.

Her reactions had done him more good than the drug. The thing he had learned went back into its proper place in his mind. There was nothing horrible about the teleporting of a ship over twelve quadrillion miles of space; he'd accepted the fact when it had happened to the *Waraok*. If Skora had shown him a huge machine using begawatts of power, he could have accepted that. The shock had come from discovering that it had been done with nothing but a piece of clay for power. Also, he'd been sent to find an enemy secret and had found the secret where he had least expected it. That was all.

"I'm all right now," he told her, "but I wonder if you can take it. Call Kayel in here." He swung out of the bed and grinned as she began backing out of the room.

He was dressed when the two came back. Ferad had declared his citizenship here, and he could rot in it! But the other two had to know. He gave it to them as fully as he could.

"Tommyrot!" Siryl said automatically, though her voice was uncertain, as if she were trying to remember how he'd returned to his room. "You were just delirious. Some disease here—"

Once, Derek thought, men had developed a science of psychology, according to the old reports. But it had been lost during the Collapse, with only the mechanical tricks for relieving neuroses remaining. No wonder the worlds were filled with sick minds if Siryl was typical of her profession.

Kayel put his pipe away, looking at her as if he were thinking the same, with the woman-adulation gone from his eyes for the moment. He swallowed, his Adam's apple bobbing grotesquely. But his voice was as clear as when he discussed physics. "It fits. Oh, not the stuff about the god. That's probably mumbo jumbo to cover some master power source and the men who run it. Maybe it's a mechanical educator, too, with a library saved from before the Collapse. The machine must have prevented the Collapse here, and they've gone right ahead while we fell back. We're just working on theories about immense fields of energy in space that can be tapped for antigravity, identity exchange control—all that. They use it already! Derek, we've got to get this back to the Federation."

"But the way they live?" Siryl protested.

"Why not?" Derek asked. "With power like that, they don't need the usual heavy science and gadgetry. There's no reason not to live the simple life."

Kayel was pacing about, sucking on an empty pipe, and working a flush of excitement. Normally, it was easy to overlook his mental powers, but a good physicist had to have mental flexibility; he was supposed to be one of the best. "We can't conquer them—not when one man can handle a fleet. But we look enough like them to pass among them, once we know what to expect. We'll drop a few small fliers into the wastelands. With any luck, they'll find the god machine. Derek, do you think they'll still let us work on the *Sépelora*, now that you know?"

It had been bothering the captain. He shrugged uncertainly.

"I told you not to break their taboos!" Siryl reminded them. "I also told you this had to be a homogenous culture! Now maybe you'll listen to me. They have to have *some* neuroses; any isolated group has. What we've got to do is to find their weakness. Kayel, they think you're smarter than they are. Let's—"

Derek had heard enough. She still had a genius for remembering only when she'd been right and assuming she always would be infallible. He turned toward the door. "Coming, Kayel?"

The little man hesitated, obviously swayed by the chance to work closely with her. Then he smiled apologetically at her and followed Derek.

She sat in offended dignity through breakfast. Luckily, Wolm was there and Lari kept up a steady stream of talk, trying to get Ferad to join the boy in some project or other. Nothing was noticed by the two natives. And nobody tried to stop the two men as they headed toward the ship.

Michla was busy seeding something on the harrowed field. He'd already added nitrates and other fertilizer—probably from the same planet as the water, carefully selected and dissolved in it. He called out a greeting as they passed, and they waved back. It was all friendly and normal. Derek breathed a sigh of relief as they swung around a pile of boulders.

Where the spaceship had rested, there was nothing but a depression in the ground. And coming toward them from that was the gray-bearded priest, the serape over his shoulders whipping about him in the breeze that was blowing. His face was serious as he drew near them.

Derek stepped toward him, trying to force anger to replace the fear that was thick in him. "Where's our ship, Skora?"

"Safe. Up there." The old man pointed toward the sky above them. "In an orbit around Vanir."

"So we're prisoners?"

Skora sighed, and he seemed embarrassed. "Not exactly. We feel obligated to you for bungling the way we handled the return of your ship to Sirius, Derek, and we'd like to return you. But that must wait for further study. You have full freedom here, though. And if you are permitted to leave, the ship will be ready."

"And I suppose you'll make up all the time when we should be repairing it?" Derek asked grimly.

"We have already done that. We repaired it last night, before we sent it up. Not the space-denial generators—that is beyond our understanding. But from god we learned how to use what was there to set up the much better time-negation drive that was used before your Collapse."

"But . . . time-negation—" Kayel swallowed, stumbling. Derek hadn't known that the little man understood Classic. From the accent, he must have only a

reading and weak hearing knowledge of it. But he obviously had understood enough.

"Yes, time-negation works." Skora smiled at the man's amazement. "It's simpler in application, but much more difficult in theory, I believe, than space-denial. It was discovered by accident when our common ancestors had no right to find it. Fortunately, god knew how it worked. And your ship will be ready for you if we find we can let you return."

He was heading back to the village, and they were following without thought. Kayel caught Derek's arm, pulling him back out of earshot. He spoke in hasty Universal. "We've got to forget the ship. Now it's up to god and his charms. Derek, I've got to see how those amulets are made."

"But they were nothing but baked clay. We took one apart," Derek protested.

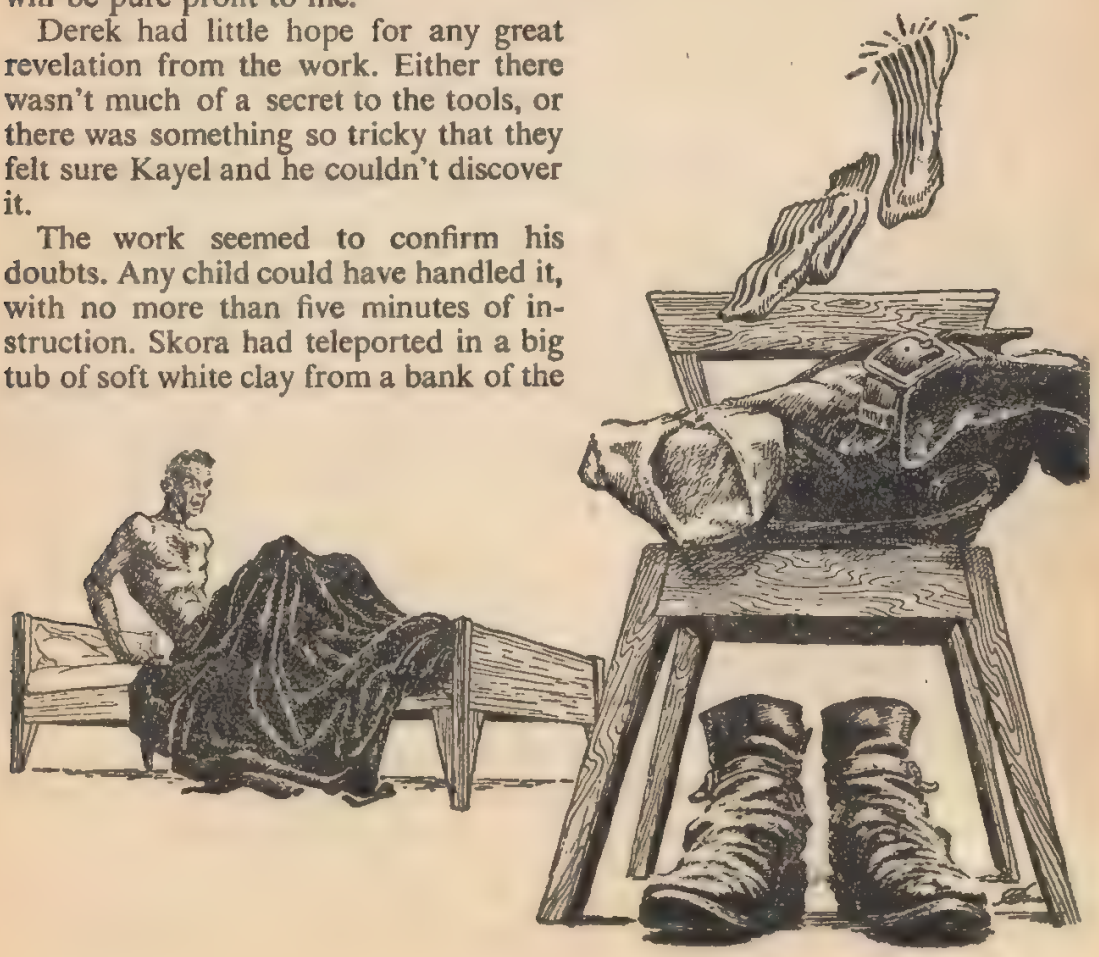
The physicist shrugged. "A transistor works because of a few parts per millions of impurities. A detector works because of its crystalline structure. Take his job?"

Skora had noticed that they weren't with him and had slowed his steps. Derek caught up, trying to look somewhat cheerful. "I guess we'll have to get ourselves a house of our own and stop bothering Lari until you decide, then. And since we can't use the power of your god, we'd make pretty poor farmers around here. Is the job in your kiln still open?"

"Is it?" The old man chuckled. "Do you think I like doing it by myself? And since we'd have to feed you and care for you even if you did no work, your help will be pure profit to me."

Derek had little hope for any great revelation from the work. Either there wasn't much of a secret to the tools, or there was something so tricky that they felt sure Kayel and he couldn't discover it.

The work seemed to confirm his doubts. Any child could have handled it, with no more than five minutes of instruction. Skora had teleported in a big tub of soft white clay from a bank of the



stuff beyond the village. They had to pack this inside metal molds, press them down firmly and let them rough-dry until they would hold their shape. Then they went into the kiln to be baked. Finally, Skora inspected them, throwing out the defective ones along with his own hand-formed failures.

The priest answered Kayel's stumbling questions without any hesitation. The material wasn't important, so long as the final product had the right shape and the markings on it were clear. They had a few metal tools, but these were rare and too heavy for normal use.

"You can think of them as instructions," he suggested. "There is too much to remember easily, and these help. They . . . well, they describe a stress in space, more or less."

"Then plastics would work? Because if they would, there are a thousand pounds of thermoplastic in the ship's stores, and we'd save a lot of time here," Kayel suggested.

Skora apparently thought it was a fine idea. He questioned the physicist about what to look for, and the stock of plastic was suddenly in front of them. They began boring small holes in the molds for pouring the plastic to make unbreakable amulets, and the work went faster after that.

On the way back to Lari's that night, Kayel shook his head positively. "Nothing, Derek! Nothing can be concealed in our own plastic. The secret has to be in their god."

A god who wasn't immortal, though he had lived for at least twelve hundred years; a god who taught the children somehow though he had been dead for a hundred years. A god who could fling a seventy-thousand ton ship quadrillions of miles instantly!

Derek lingered after the second day of work. He took the bottle of beer from the priest and dropped to a seat. "Skora, I'm still curious about your god. And this time, I'll try to behave myself. How long did he live?"

"Since before the sun exploded. Let's see." The priest tipped the capped bottle up without thinking. Beer seemed to appear just beyond the seal and run into his mouth. "He was about sixty of your years old then. He came here to see us about five years before the trouble, I think. I could find out, if you like."

Derek took his eyes off the other's drinking habits and swallowed his own drink, trying to find some point of exploration. "I haven't heard any stories about his creating the world or your people, at that. No legends of that?"

"Of course not. We evolved on Terra, like your people; and this planet grew from the usual space whorl." The old man chuckled. "This isn't a religion. God had some strange ideas that are getting distorted lately. Many of us have a belief in some divine spirit, Derek, but we try not to confuse that with god. He was just a man. Kayel knows more than he did, though not the same—and all of us are stronger than he was."

"He didn't teach you to worship him, then?"

"He didn't know." Skora shook his head sadly. "He thought we would mostly be dead. He didn't care and couldn't know what happened to us. He was unconscious. And when he revived, he was sure we were dead. With his stories all ruined and nobody to save him, he went crazy. He began blasting his way out and brought down a rock on his head. Naturally, with his skull crushed, he died.

It was just as well. He couldn't move the rocks to get out and he'd have been afraid of the world we'd made."

It made no sense at all. Their god couldn't even move rocks out of his own way. Yet the rains fell, in spite of the fact that the amulets were nothing but symbols. The power had to come from some source. "So he was destroyed. Yet you say he still is!"

"He's there, and the young learn from him still. We had to find out how to build the time-negation drive from him since you came." Skora found another beer, remembering to open this one. He was mellowing from the liquor. "Derek, I don't know. He's dead and he's deteriorating—slowly, but the changes are there. We've always been in danger of becoming superstitiously dependent on him without realizing how much so we are. But now, some of us are worried. As he deteriorates, he may warp our children. Sometimes I've thought of digging him up and destroying him."

"Why don't you?" Derek suggested softly.

"I've thought of it. As senior priest for Vanir, I could. But it's hard—Emotional attachment, I suppose. And fear of what would happen."

Derek frowned. "Suppose I were to destroy him?"

The old priest looked up, studying him, resolution coming slowly. "You could! Of course, *you* could! Derek, one more beer! Then go home. And be back here early. We'll do it!"

Skora's hands were trembling as he reached for the bottles.

VI.

Siryl would have none of it.

"Nonsense," she told them after she had heard the story, along with Kayel. "Primitive cultures don't breed agnostics. Skora was just drunk or testing you! Probably saving face by trying not to act superstitious. Derek, if you break any more taboos—"

"They aren't primitive! Siryl, if you can't get that much through your pathological skull, go outside and watch it rain for a while!"

She stiffened and then cloaked herself in profesional calm. "A culture," she recited, almost by rote, "observed *in situ* may have certain apparently inconsistent developments, usually as a result of some isolated individual genius or accidental discovery. These, however, do not violate the fundamental attitudes and emphases, the cultural gestalt, but are inevitably assimilated emotionally. That means, Derek, that they can have a machine left over from pre-Collapse days that makes miracles—but they still think it's magic. If you'll drop your persecution complex and listen to—"

He grimaced, and then grinned slowly. "My hairy-chested persecution complex, you prude!"

She drew in her breath harshly and marched out of the room, white to her lips. Kayel looked sick, starting after her and turning back. "You shouldn't have done that, Derek!" he protested. He sighed, shook his head, and sat down slowly, reaching for his pipe. "I wonder what we'll find—and whether Skora will do it?"

Derek had his own doubts, but they found the old man ready the next

morning, with Wolm behind him, carrying a supply of amulets and two battery torches he must have pulled from the *Sépelora*. The priest looked as if he had been unable to sleep, and the porch where the school was usually held was locked up tightly.

He saluted them, his eyes still troubled, but with no doubt in his voice. "The place is on the other side of Vanir, deep in a cave we built. He expected the explosion toward the last and had the one of us who could use his power dig two such caves—one for him, one for us. He had a machine—We almost starved and died of asphyxiation, until that one who could use the power found from god how to bring food and keep fresh air coming from another world."

He sighed, and his eyes ran across the landscape and the growing fields. "When we came out years later, the world was a cinder, and god had to teach us to restore it and to farm it. At first, we thought of moving to another world. Even the air here had to be brought in. But we stayed near god. Well, let's go!"

There was an abrupt, sickening shift of scenery and they were standing at the base of a mountain that stretched up as one of a huge chain, barren and forbidding. Only a few stunted plants existed there, and the sun was purpling the sky in the west. Ahead of them was a cliff that stretched up nearly half a mile, and there were two rubble-filled holes in it, near them.

The priest motioned to one of them, and Wolm moved ahead. He had what seemed to be a huge umbrella without covering. He pointed the ribs toward the fallen rocks, twisting it slowly and feeling the swiveled handle of clay. He came to the stones and continued walking. The rock seemed to flow away from the device, compacting itself against the walls of the older passage that was there.

"This is the way he taught Moskviz, the only one of us who could learn the power," Skora explained. "God came across space from Terra to study us with other scientists. When the enemy began exploding suns, he stole us to help him, taking all the supplies he could carry. We built this cave for him, and the one beyond for ourselves. Fortunately, the sun's explosion was a weak one."

He was worried, but oddly determined. They were moving downward and forward. Then they hit a clear passage that wound down and down. It must have taken a great depth to protect them from the solar blowup. Other people had tried it, without this digging device, and had failed.

They reached a long section where the passage was clear and foul air rushed out at them. Skora reached for an amulet and cold, clear atmosphere blew in rapidly. Derek wondered why the old man didn't simply teleport them into the cave where their god lay, but decided to let the question go. It was probably only a means of delaying the accomplishment. His legs ached, and Kayel was panting, but they went steadily down.

Finally it flattened out and another five minutes of walking brought them into a partially clear chamber. There was a great radium motor on one side, whirring softly. In the center stood a huge glass case, covered with thick layers of ice from the ages of slow atmospheric seepage. Oxygen tanks were beside it and stores of food and equipment lay about, all rotted and useless now. Wolm scraped off the ice at a gesture from the priest, and Derek stared into the tank.

Doubled up on the floor of the case was an old man, his face hidden by one arm, his neck bent at an impossible angle. He was naked and fat, with the waxy color of frozen flesh. One hand lay near a heavy notebook and the other clutched an archaic type of heat-projecting rifle. A rock lay near the wound on the back of his neck, and another had wedged itself into the hole at the top of the case, sealing it with the layer of ice around it. From the breakage inside the case, it was obvious that he had gone mad, to wind up shooting at the ceiling above him. The cooling system must have been cut off before he revived, but it had somehow gotten turned on again during his insane frenzy.

"Suspended animation!" Kayel said. "There were accounts that it had been developed. But no details on the cooling, chemicals in the blood, the irradiation frequencies. Skora, was he a biologist or biophysicist?"

"No, he stole the parts from the place where our people were studied," the priest said. "Another man meant to use it, but god took it. And he didn't adjust it right. He wanted to wait fifty years, but it was twelve hundred before it released him. We left him because we needed him and he was preserved in this."

Wolm had drawn closer to the case, trembling. Now he bent his white face down and stared into the case. Skora stood beside the boy, indecision working on him.

"What do we do now?" Derek asked, as gently as he could.

The old man sighed. "I don't know. The enzymes of his body are bringing a slow decay, despite the cold. And things go wrong with the teaching of the young . . . but without him, god is gone and Vanir may have no power. If I could only be sure—"

He waited, while Derek stared at the case and its machinery. At first, he had wondered if it might not conceal the great machine that could perform the miracles he had seen. But Kayel had looked it over at once and had shaken his head. It seemed to be no more than it was supposed to be. And that left only their god—a fat, dead god who had gone insane because of his weakness and his fear.

"*No!*" Wolm broke. The boy's shoulders heaved. He buried his face against the case, shouting and clawing at the ice. "No! Skora, you can't. He is all we have. He's holy! Don't touch him! God will come again! I saw it. It is *his* thought! You can't—"

Skora's fingers moved on the amulet savagely. Wolm's body snapped out of existence, while flakes of ice trickled down where he had been.

The priest looked sicker than before. "I sent him home," he said. "Derek, that is what our youngsters learn now. There is decay, and distinctions are going. The old emotional superstitions are stronger than later logic, and all children used to have them. Now they creep through into the minds of our young. A decaying mind and an insane one—and our children absorb *that* knowledge."

He sighed heavily. "And I . . . even I must have absorbed some of it. I can't destroy him! It's . . . horror! Derek, it's up to you. Do what you will. I'll wait fifteen minutes for you and keep the air pure here for you. But I can't even watch!"

He was suddenly gone, too.

Kayel swallowed thickly, his neck bobbing against tight muscles. He reached for his pipe, then stuffed it back. "But if he loses his power when the body is destroyed, he can't keep air for us or get us out!"

Derek kicked at the glass case. Kayel hesitated, and then joined him. It broke finally, and they waited while the blast of freezing air wheezed out, foul and miasmic. Derek reached for the weapon, but it was too cold to touch. He kicked it around with his foot until he could point it toward the corpse, while he found a bit of cloth he could use to cover the trigger.

Kayel knocked his arm aside before he could fire. The little man pointed toward the notebook and began hastily ripping off his shirt. He scooped up the book and spread it out on a low couch, ripping off the thin plastic that protected it. "We still have fourteen minutes, Derek. And this may be our only chance to find the secret."

The captain stepped back, feeling relief wash over him. He had been bracing himself to take the chance, but the excuse to delay it was welcome. If burning the body destroyed the power of god, Vanir would be just another primitive world—and they would almost certainly die before they could get out. If the power remained, there would still be the need to warn the Federation of the menace here—and no clue on which to operate.

Kayel flipped the cover back and skimmed through a few pages as quickly as he could turn them. It was obviously written in Classic, heavily interspersed with strange mathematics like none Derek had ever seen. From Kayel's puzzled glance, they were equally strange to him. He turned to the front again. Then he pointed. "Aevan—god is Aevan!"

The book was described on the first page grandiloquently as the diary and records of A. Evan, the discoverer of metadynamics, the only true science of all time—the full and final work, from which the notes the world had been unready for had been extracted.

The body of the book began with the man's need of people with an unusually well developed "ability" for his experiments and his discovery of the border world of Vanir, where scientists had bred small groups for special abilities and were studying them.

In one of those little colleges, he had found the children he needed, and one child had proved capable of manipulating space as Aevan had been sure was possible. Moskviz had even been able to force a few of the other children to bridge the difficult gap and begin work on it. There were long experiments and formulae for levitation, teleportation, penetrability, and other things. It ended on a note of self-adulation for his own success, in spite of the poor material he'd had with which to work.

Derek frowned and went back carefully, looking for the missing factor. The mathematics looked good, and in time Kayel could probably figure them out. But Aevan had been unable to make them work himself. It had taken some other ability.

He found it finally, in a footnote he'd skipped. It was telepathy. Aevan had known that the mental power needed was related to telepathy, and had been forced to find a group which had been bred for that. The boys on Vanir who succeeded had had more than eleven generations in which to build up such power.

Telepathy! And since the Collapse, while Vanir went on with its exclusive

breed of telepaths, the rest of the worlds had had no such power; the psychologists had proved that it had been bred out of humanity, if it had ever existed. Yet without it, the mathematics would be useless. Only Vanir could have infinite power.

There the children had been forced to use it to survive. The one advanced one had somehow taught the others, and they had stolen their ideas for survival from the mind of Aevan. In suspended animation, his thoughts were nearly still, but his memories remained, and they could be tapped. Even dead, the memory cells were preserved for a time, though now they were deteriorating at last.

The amulets were only traditions to help them—they had used them as children, probably, to remember and feel the complex mathematical formulae, and the use of the tools had become so closely associated with the power that nobody questioned it now.

Derek tossed the book to Kavel and reached for the trigger. Nothing visible came from the weapon, but the body of the god—or Aevan—charred and began to vanish, along with most of the wall of the case behind it. Fourteen minutes had gone by.

He began to tense as the seconds drifted by, picturing Skora standing up there without the symbol of the power he had used, uncertain of his own powers, afraid to try them! If the man couldn't work without the familiar—

Abruptly, they were back at the foot of the mountain, outside the tunnel they had cleared. Skora stood there, his face strained and white and his hands shaking; but his eyes were burning with the end of more than a thousand years of slavery to a useless custom and the fear of its loss.

"It worked—the tools still have power!" His voice was hoarse, as if he had been shouting.

Derek had one final test. He turned toward the priest, keeping his lips sealed and trying to throw the words silently out of his mind toward the other. "*Not the tools, Skora. They were only memory aids. All you need is the knowledge and power that you have in your own mind. You were bound to a superstition!*"

Skora smiled wearily, his eyes moving toward the book Kayel still held. He nodded thoughtfully. "Superstition? I suppose you're right," he admitted. "Or conditioned reflexes of thought. Until about the age of nine, it was easier for a young telepath to explore the passive, unresisting mind of god than that of a busy adult. Eventually, it became the only way for them to learn in our culture. Now I suppose we'll have to train teachers for the children."

Kayel was staring at them, his mind busily adjusting to the new conditions. "Telepathy!" he said, without fear, but with a growing sense of wonder, as he knitted his brows and stood silently while Skora seemed to listen. Derek wondered why his own mind wasn't curling up in horror at being read. But what difference would it make? He'd helped Vanir, but the Federation could never use the secret.

Skora sighed at last. "Sanity, new morals, many other things, Kayel. We only deceived you about our ability to read minds, and that for your own good. We were afraid it might be too disturbing. And we're doubly grateful now. If there is anything we can do—"

"Send us home on the *Sépelora*," Derek suggested.

"The affairs of the rest of the universe are not ours, Derek," the old man answered, and he seemed genuinely sorry. "We can't risk having them brought to us by returning you. The decision of the majority went against me. Now all I can do is make you welcome here on Vanir."

Derek stared up at the sky where the *Sépelora* lay out of reach but ready to carry them home. He let his eyes fall again to the planet that was to be their prison. He had come to like the people and to feel more at ease among them in many ways than among his own race. But there had been hope, until now.

"All right," he said at last. "Keep your world, Skora. Live on it comfortably while the rest of the human race nearly kill themselves in another war. You'll be safe. Dredge up a few more tricks from Aevan's notes. You like being alone—most provincials do. And it won't matter in your time. But when the children of my people find mechanical ways of doing what you do with your minds—when they sweep in here with ten battleships for each that your people can handle—remember that you could have joined us and saved us from the enemy that burned this planet once already. When that happens, cry for the brotherhood of men. See what they think of a single planet that kept its secrets to itself. Skora, send us back to Lari's and let us alone!"

Skora reached for the amulet. Then he threw it away and stared at them, frowning in concentration without the help of tools. His hands clenched at his side.

They stood in Derek's bedroom.

VII.

Derek lay wearily on the bed while Kayel's low voice went on explaining things to Siryl. The woman had resented their going off without her, even though she had wanted no part of the trip. But now her hurt scorn had cooled

down to an unbelieving interest. In a way, the captain thought, she had been right all along. But she didn't seem to be enjoying it. He started to turn over.

Siryl screamed thinly. By the time he could look, she was throwing Aevan's notebook away and whimpering. "No!" Her voice was low now, but rising slowly toward hysteria as Derek got off the bed. "No. No! It *can't* be telepathy!"

"It is," Derek assured her. "I tested it. So did Kayel."

Her face contorted, and she swung toward him, groping for support. She found his shoulder and buried her face in it, clinging to him, her nails digging into his back as she strained closer. "Take me away! Derek, take me away. I can't stand having them read my mind—every thought I ever had, every wish. *Derek!*"

He reached up to disentangle the hands that were trying to dig through his backbone. "Siryl—" he began.

She flung herself away from him and groped toward the door. But Kayel was there, his tortured face sympathetic. The little man caught her, and she dragged herself against him. He drew her closer, while she sobbed, standing the pain of her hysteria as if he were being knighted.

"I'll protect you, Siryl. Someway I'll protect you. They aren't going to read your mind. I won't let them." He was scowling furiously with some effort as he tried to comfort her. His eyes turned toward Derek. "Maybe if they know about their god now, they're upset! Maybe they won't think too well. Get Lari, Derek—she's not very suspicious, I hope. And don't think about anything except that Siryl's sick."

The woman had whimpered at the mention of Lari's name. Kayel drew her down beside him, rubbing her hair gently. "There, there, baby. Nobody is going to read your mind now."

He found Lari in the kitchen, naturally, and brought her back with him. She was wearing her big apron with the amulet pockets, and went ahead of him with the bowl in her hands clattering against one of them while she went on stirring—the picture of a quiet housewife, Derek thought bitterly. With the power of a god!

"Lari," Kayel told her, "Siryl's sick. We're not just like you. We're neurotics —we have been since the Collapse. We need things you don't have which are on the *Sépelora*—Ferad will need them, too. Can you send Siryl and Derek up for them? They'll know where to find the drugs."

Derek started to protest. But this was more important to the physicist than escape. He was being the space knight who could slay monsters for his lady. The captain glanced at Lari, trying to keep his thoughts down. She puzzled over it, but seemed completely unsuspicious. It must have been a hard day for her already, and her mind wasn't on the request.

"I guess so," she answered, "if I sort of pretend god is still there and use the amulet. I'll have to concentrate. You stir this till I work it." She handed the bowl to Kayel, who took it quickly, keeping the swirling bubbles in the mixture going.

Lari pulled out the amulet and clutched it firmly. She bent over it, hesitated, and looked up. "No sense in two of you going for a few drugs," she commented, and clenched her hand.

Derek found himself in the control room of the *Sépelora*, beside a new bank

of instruments. He let out a yell of protest at the miscarriage of Kayel's plans, but his finger hit the red button that was still marked Firing Pin. There was no way he could go back for them, nothing he could do to help. And he was still captain of the ship, in the service of the Federation, with a job to do.

The *Sépelora* came to life. There was no blanking out of the ports, but the stars began rushing by at an incredible rate, while the radar checked them and threw the ship about to avoid a direct hit. They were making better than a thousand light-years an hour!

Derek found the instructions beside the new panel and began setting their course for Sirius. He had no idea of how the machines worked, but that would be for experts if he got back; and it was something to aid the Federation, at least.

He could feel the breath of fear blowing down his neck as he worked frantically. Lari might not be able to handle a time-negation field. She might have to waste time in hunting for Skora. Or perhaps none of them could work through this. Perhaps there was no way to locate him. He could be sure of nothing, except that each thousand light-years gave him a slight added reason for hope—and that it wasn't enough.

He wondered about Siryl and Kayel. She might be sick at their failure, but she was probably female enough to appreciate the attempt Kayel had made more than the fact he hadn't delivered. And she'd been rocked by telepathy enough to seek comfort where she could find it and in the strongest manner.

Then he went back to worrying, staring back in the direction of Vanir. He had no idea of how far they could reach. Maybe they could throw things farther than they could suck them in. The *Waroak* had been tossed two hundred thousand light-years. But the people of Vanir had gone out only a few light-years to bring supplies. Maybe he was already safe.

He began to think so as the hours drifted by. And he began to appreciate the time-negation field more as he saw the simplicity of the generators. He could already construct another set from memory, if he had to. With this, the Federation still might win.

Worry over pursuit kept him from sleeping until fatigue finally took over. That day and the next went by. Then the next.

He went to bed with more confidence. He'd underestimated the speed of the new drive and was already half the distance back to Sirius—they should have stopped him before that, since he was now near some of the outer fringes of the Federation. He considered landing on one, but decided against it. The farther he went, the better. And the drive should be taken directly to headquarters.

In the so-called morning, his head was aching as if the back of his skull were about to split, and the worry was back. There was no reason for it, except the jinx that had become such a part of him. He swallowed anodynes and fought off some of the pain, but it kept coming back, as if something were bursting inside.

He made his way up to the control room, while the feeling that he had lost grew stronger and stronger inside him. He should have remembered that the anodyne was a depressant. It wouldn't do to go into a fit of depression now, while he was nearing home.

He opened the door to the precabin, strode through it, and into the cabin beyond. Then he stopped.

Skora sat in a seat there, staring at the great spread of stars that streaked across the ports. This time there were no pants of homespun and no scrape over the old shoulders. The beard was still there, but shortened and trimmed. It projected over the collar of a Federation Fleet uniform—and on the side of the collar was pinned the double cluster of a galaxy commander!

The old man saluted crisply, smiling in amusement at the gesture, and waited while Derek's arm automatically returned the honor. "As you were, captain!" Then he sobered. "As you can see, Derek, your words made an impression on me. Vanir couldn't stand in a backwater, hoping that men would never catch up. Nor could we forget that we belonged to the race of mankind and were all brothers. Telepaths are unusually sensitive to that argument, once it's pointed out to them. I couldn't convince enough of our council. But after I teleported myself to Sirius and convinced your command there, it was too late for Vanir to retrench. We aren't limited to one planet now, clinging to the memory of a decaying god. Now there are two millions of us being fitted for your uniforms—enough to win your war without having to destroy the enemy we both fought once before."

"And I suppose headquarters took one look at what you could do and made you all officers," Derek said bitterly, remembering the years he'd spent fighting for a mere Sector Commander's rating.

The pain in his head broke over him again, and he doubled over. Skora seemed not to notice.

"It wasn't hard, Derek. They were paralyzed with fear of new weapons until they were beginning to lose the battle. Your command had its own superstitions. And reading their minds helped me to find ways of convincing them. Then, when I could, I came to take you back. I've been waiting here for you for hours—though not idly."

The pain hit a sharp peak and faded somewhat. Skora was staring at him intently, and he covered the remaining pain under automatic questions. "How's Siryl? And I suppose Kayel is happy working out more of the mathematics for you?"

"Siryl—" Skora paused and shrugged. "Kayel has her promise to marry him, of course, and is a new man. She is recovering, we hope, since he made her a metal net and told her it would keep us from reading her mind. It won't, if we try, but she needs her little superstition, if she's to stop hating us."

Derek stared out at the stars rushing by, knowing he had won what he had been sent to win—and had lost the Federation. His jinx had outgrown him, and had spread to the whole race.

Now Siryl hated and feared the men of Vanir for their power to see the things which a prude must conceal within her own mind. She might get over that; perhaps she could learn to accept their power. But in time, all the women on Federation planets would have to hate the telepaths—not for themselves, but for the sake of the children who should never be born into the life that must come.

Skora had spent a few days gaining himself the coveted rank of galaxy com-

mander, while Derek had never dared to hope he could rise that high in a lifetime. And Skora's people could have everything they wanted for the asking.

Monsters were loose on the world. Until power could corrupt them, they might be kind monsters. But they were worse than any enemy defeat could have been. They would save the Federation, but after the triumph, those most fit would own it. The men who had built the star ships would never control the future—that would be left for the conquering march of the men who had done nothing, but had simply been given a power denied to the rest of the race.

"There was an old legend," Skora said suddenly, "about a boy who lived with some kind of animals. When men discovered him at the age of twelve, he was a savage. He was unable to talk—and nobody learned how to teach him. Yet his powers of speech were latently as good as those of any man."

The pain had lashed out again at the man's words. Derek let them slip over his mind without trying to understand. Skora was reading his mind, but it didn't matter. He went on thinking, forced to recognize that he had brought total defeat to all nontelepathic men. If there had been any hope—

But the psychologists and geneticists had looked for the power of telepathy in the current race, and had found none.

Skora stirred impatiently. "Telepathy never occurred strongly in men more than once in perhaps a billion births. Even in the group at the place where god found us, only Moskviz had any great power, after all the careful breeding for it. He had to teach it to the others, so that they would not be wolf-boys in the world which the explosion left them. And Lari and Ferad are having a child—who will learn, like all the rest of us, even though Ferad is its father."

Derek groped for the hope, and then shrugged. It was a good line for the rest of the worlds. It would give them faith in their future, while Vanir replaced them. They could believe that with a little more work and time, they would slowly develop the power—and their "teachers" would find ways of convincing them they were succeeding. Maybe they needed faith, no matter how wrong it was. They would forget the legends that spoke of a time when the strange *psi* factor was bred out of the race—for the benefit of a few, as he now knew. They would

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pretend there was only one race, instead of the two into which it had been split.

The pain caught him again, and Skora got up sympathetically to rub the back of his neck. It helped. "Men," the old man told him, "having been finding ways to claim they are not all one race since there were human beings. But it's still wrong. And science has made mistakes, while legends are only superstitions."

The old fingers found the spot of greatest anguish and began rubbing it out. Derek looked up, grateful in spite of his bitterness against what had been done. "The advantage of being a telepath," he admitted. "You know where the pain is. Thanks, Skora."

"It always hurts at first," Skora's voice said softly.

His lips had been tightly shut, and he was smiling. Derek felt his body tauten, and his eyes froze on the unmoving lips, while the voice went on quietly somewhere in his mind.

"It takes time," Skora's voice went on, with a warmth that had always been lacking in it before. "And it hurts. So does the loss of some of the things we believe—that we are persecuted, that we must depend on god, that incomplete knowledge and old legends can tell us everything, or that we are more than one race. Telepathy is never easy for an adult, Derek. But with it, we can unite our whole race—perhaps even the ones we call an enemy!"

The pain was gone now, leaving only a strange sense of completion behind it. Derek stumbled to his feet, choking over words that would not come.

The old man caught his hand, smiling, and led him to the viewing port.

"Sector Commander Derek," he said aloud, while the warm soft echo of the words came into the former captain's mind, "out there is man's kingdom. All of space! But there's no room there for any more of the superstitions we've all had too long."

Derek looked out through the ports toward the stars that rushed by as the *Sépelora* carried the two men into their future.

There was no jinx reflected in the port glass. There were only the images of two faces, smiling back at him.

THE END

THIS IS THE WAY THE WORLD ENDS

By H. W. JOHNSON

***The boy** had precognition—and he knew the world was ending. His mother knew* why, *but . . .*

Illustrated by Orban

AS Jeff Hawkes left the car parked on the side driveway and approached the kitchen door, he spotted Tommy crouched over something at the back of the yard. The boy's back was turned, and he worked industriously. Jeff changed direction; this time he would give the little scamp a good surprise.

He slipped the box of candy from his pocket and tiptoed furtively toward the boy. Something swift and dark skittered away into the weeds, but Tommy labored quietly on with his building blocks, parts of a mechano set, and some loose dirt.

When Jeff was still a silent ten yards away, Tommy rose and turned with all the grave fury of a six-year-old, going on seven. Before he had even turned, he started in, "Oh, Uncle Jeff, you've ruined everything, and you've scared him away!"

"Who?" asked the man, startled.

But now Tommy was running, his wrath forgotten.

"What did you bring me. Don't hide it. It's in your right hand!"

Jeff brought an empty right hand from behind his back. Undismayed, Tommy surged around behind him and pried the fingers from the candy, transferred to the left hand.

"Not till after supper, now," cautioned Jeff. Jeff was not really the boy's uncle but a suitor for the hand of his young widowed mother. "Who or what did I scare away?"

"Rumplestiltskin. I was makin' a bridge for him. A big bridge, and I was going to have water under it!"

"Fine, but do you think kittens like water?"

"Gee, Uncle Jeff," repliedt he boy with a child's despair over adults' intelligence, "Rumplestiltskin isn't a kitten. He's the little rat who lives under the garage. We're great pals. But he's not awful smart either. I hafta 'splain things over and over to him."

Jeff was annoyed by the "either" as well as the idea of Tommy fraternizing with rats, if it was truly a rat. Still, he said nothing as he went into the house. By this time Harriet had seen him in the yard, so another surprise was foiled, but Jeff didn't care.

"Stop, Jeff, stop! I've got flour all over my hands," she laughed.

When they were both sitting down, having a cigarette while the roast bubbled busily, Jeff gazed longingly at Harriet's shapely throat, her strong, slender fingers, her hair, and that stubborn little chin.

"How long do you think you're going to hold out on me, darling? You know this is no life for you to lead, skimping and worrying. I hate to see you trying to live off that pension. Look, while selling insurance isn't the most—"

"Oh, Jeff, I just don't know," she exclaimed turning away.

"But, Honey, you agreed the other night that there was no point in being so proud. I realize why his folks are so stuffy and why you can't turn to your father again, but Harriet, we love each other. Everything would solve itself."

"Jeff, please! We've been over this many times. I just can't explain it, but I want to wait a while before deciding about getting married again. And don't be so darned apologetic about selling insurance. I like you just the way you are. It's a lot safer than messing around with atomics and getting what Wes got."

After nearly a year of knowing Harriet, Jeff had still not lost all his embarassment in talking about her dead husband.

"Did Wesley," he asked slowly, "ever get in on this new lithium bomb stuff?"

"I really don't know," answered Harriet. "He never said more than was in the papers. They have to be pretty careful, you know. But when I heard about it—that was a month or two after he had the accident—I felt sure that that all had something to do with it.

Wes was fairly solemn about the nature of his research. It worried him whether people ought to monkey with that stuff when the world was so liable to use it recklessly. Well, I always thought he took his job too seriously—lots of men do. But now I feel he was right, and . . . and, Jeff, it frightens me!"

"You aren't worrying about that atoll they blew up, are you? What's its name . . . Ulokika?"

Harriet paused to fix her thoughts. "Not the island, Jeff. The water reaction is the scary part, and you remember the strange weather we had. They said the bomb tests couldn't possibly have caused it. But that loudmouth congressman who made the secret investigation, that Waddell—"

"I think he prefers the accent on the last syllable," interposed Jeff.

" . . . Well, anyway, it looks like he stirred up something when he exposed the effects of the Ulokika test! Or else why are the officials so mad at him?"

"But hasn't the army said it was just an illusion that the ocean water seemed to react in the explosion, too? If you ask me, that Waddell is solely out for cheap publicity."

"What do *we* know about it?" agonized Harriet. "Wes knew something, and he was scared of it, Jeff. He knew! And this congressman and his investigation,—they know something bad, Jeff; they *must!* Why have they stopped all experiments? I think they're afraid of the L-bomb starting a wild chain reaction."

"And blowing up the world?" Jeff mused. "Isn't that idea old-fashioned?"

Harriet said nothing.

"Did you know Tommy has a rat for a playmate?" Jeff changed the subject.

"Well, it won't hurt *him*," replied his mother resignedly. "And he's lonesome enough. I can't understand why the other kids avoid him. He's always been so good to everybody. Goodness knows what I'll do for his birthday! No party, except you and me."

"By the way, what should I get him? I guess a cowboy suit would be too childish for a young man of seven summers," said Jeff, his eyes crinkling.

"Oh, Jeff! He'd love it. I think I'll get him one of those fancy cap pistols to go with it."

" . . . And spurs."

" . . . And a lariat."

Jeff leaned across the table and kissed her again. "We'll give him a real nice birthday, so don't worry. I'll take him to the zoo, while you fix the cake and stuff!"

The pair in the kitchen went on elaborating plans, till Harriet screamed.

"Jeff! He *is* playing with a rat! There, look! Out the window."

Jeff said, "I'll be damned," in a low, awed voice.

Tommy had finished his bridge, and in apparent answer to his gestures and commands, Rumplestiltskin the Rat was trotting dutifully back and forth over the shaky span. The animal paused at one point and looked at Tommy. The boy bent to peer at a weak joint the rat indicated and then set about repairing the

bridge, while Rumplestiltskin retired and watched patiently by his side. Then the game was resumed.

"I didn't really believe you," said Harriet. "Why Jeff he'll get fleas and germs from that creature!"

She jumped up and called Tommy from the back door. Tommy affected not to hear the first time. But on the second summons he stood reluctantly and said farewell to Rumplestiltskin. The rat stopped pacing the bridge and solemnly regarded the boy as he dragged his feet to the house.

"Upstairs, Tommy! And wash those hands thoroughly. Soap and good hot water, you hear? And then I want to see you."

Tommy went to the door dejectedly, but then halted with an earnest face.

"Say, Mom! Can I have a space blaster instead of a cowboy pistol? Please! One that shoots sparks? Jackie Sloan has one and—"

"And just what makes you think anyone is going to give you a cowboy pistol?"

"Huh?" stopped Tommy. "Well . . . someone whispered to me—It was a brownie, Mom, it was the little brownie who—"

"Thomas Blaine! Tell me the truth!"

"Well, I . . . I heard—I just sorta knew— Well, weren't you?" Tommy squirmed.

"Tommy, have you been hiding by the window and listening when you shouldn't?" his mother accused.

But Tommy denied all knowledge doggedly, except that he "sorta knew" she was planning to get him a cowboy cap pistol.

"Aw, anyway, won't you get me a space blaster, huh, please?"

"We'll see," she concluded, with an ambiguous threat. When he was gone, Harriet turned to Jeff.

"Maybe you're right. He needs a man, a father to take care of him, too. Just lately he's started sneaking and eavesdropping, and telling lies about it. If he had a man's influence at home, perhaps he wouldn't do whatever it is that makes the other children dislike him."

"You're not being logical, dear," Jeff smiled, "but I'll buy your conclusions."

"Don't rush me," she laughed and then frowned. "But I'm serious, too. Tommy's getting too old for that fairy-tale talk, and he's getting to the age where a boy needs a father if he's not to grow up a sissy.

"Well—enough of that or you'll start talking orange blossoms again. You will have to set an example if you're going to be a father, so go along like a good big boy and wash up. Things are nearly ready now."

After supper, when they were alone, Jeff asked Tommy jokingly why he hadn't also begged his Uncle Jeff for a spacesuit to go with the blaster. Tommy mulled over his answer and apparently finding no acceptable grown-up reason, replied hesitantly.

"Well, you wouldn't be able to get me a cowboy suit *or* a spacesuit, so I didn't bother to ask."

Uncle Jeff was taken aback. "Why couldn't I get you a spacesuit if I wanted to?"

" 'Cause they cost a lot of money, and you're not going to get the commission 'cause the big sale is going to fall through tomorrow." He seemed to pronounce the words carefully, by rote.

"Look, you young whippersnapper," expostulated Jeff Hawkes, half amused

half perturbed, "that's defeatist talk, and you are lucky your mother didn't hear you talking that way."

The next day Mr. Winters announced that he had reconsidered and decided another company had a better plan for his employees. The big deal collapsed under Jeff's nose. But the birthday party two weeks later was a thumping success anyhow.

Jeff gave Tommy a toy spaceship. Harriet gave Jeff the wonderful *yes* he had waited for. And three pairs of eyes sparkled with happiness over the candlelight, which Tommy extinguished with one huge puff. If anyone was not completely happy, it was, strangely enough, Jeff Hawkes. But he kept his worries to himself, as Harriet babbled gayly of honeymoon plans, what to wear, and how happy they would be. For reasons she couldn't have analyzed, her delay and wavering about remarrying was occasioned by vague alarms concerning Tommy. The decision once made, her mind relaxed.

But the burden of that concern had shifted onto Jeff.

Jeff Hawkes lacked intuition, but he did have conscious reflections, based on apparent facts. And the conclusions left him more than just uneasy.

At the zoo earlier that day, Jeff had gained Tommy's confidence by crossing his heart solemnly and honestly swearing himself to secrecy. As they watched the beasts in their cages, Tommy basked in his new freedom. Now he could confess things people didn't want to hear, things they had ridiculed or refused to believe before.

"Now that ole lion sitting there," prompted Jeff. Tommy concentrated a moment.

"Well, he's thinking it ought to be time for the keeper to come with his meat pretty soon. And he wishes the people would be quiet. He's hot and tired now, and he wishes he could hurry up and eat so's he could go to sleep and know they wouldn't be waking him up to eat."

And later. "What about the monkey swinging around and around the cage?"

"Oh, he's just showing off," replied Tommy with disgust.

"Showing off for us?"

"No. They don't care much about the people outside the cages. He thinks if he shows how good he is, the girl monkey in the next cage will think he's good, and then the keeper will have to let him go over there, and—" Tommy stopped in confusion about how to go on and whether he ought to.

A silence fell between them as Jeff was struck by a new thought. He picked out a secluded bench, and when they had sat down and had a few handfulls of popcorn, Jeff spoke.

"People?" said Tommy, "I don't know. They're much harder. See, animals don't think much, and they keep thinking it over and over again so its easy to sort of hear them. But, well, gee, I don't know! People keep changing thoughts and think more things at one time. Sometimes I can tell, 'specially if *I'm* in it. Kids are a little easier than grown-ups, but they all know I hear them, or guess, or something, 'cause they just don't like me. But you're good, Uncle Jeff. You're the first grown-up to understand, and you aren't mad either! You *weren't* mad, were you, when I knew your big sale wasn't going to work?"

"No," said Jeff slowly, seeking the best tone of voice to keep Tommy's confidence. "But does it work that way, too? I mean you can tell what's going to happen as well?"

"Well, only what somebody's going to *think* about something that'll happen."

As they went on through the zoo grounds, Jeff listened less to Tommy's running commentary on the animals' dim thoughts. Jeff had had proof enough, he thought, not to believe the boy was making it up, which is what the other people staring in the cages imagined. The idea was monstrous. Jeff felt feverish and lightheaded. It seemed a part of some nightmare, and he put off deliberating what he ought to do about it.

It wasn't until nearly time to return for the small party that any practical test or application of Tommy's powers occurred to him.

"Tommy," he remarked tensely as they got into the car, "if I were to bet money on a race, say on Tincup in the third race this afternoon—would I win?"

"I dunno," said Tommy, hopping into the seat beside him. "You aren't going tc really do it, so I don't know. Where's my bubblegum?"

Impatiently, Jeff searched around till the package of gum was located in his coat pocket.

"But if I have already bet on Tincup—"

"Then I might know if he won, because you'd be happy and think a lot about the money you'd win."

" . . . Or lose. And I'd be thinking what a fool I was." Not to know till after the action was committed seemed little better than knowing after the race was over. The problem absorbed him, and without realizing it, Jeff was driving toward the race track and not back to Tommy's home.

It took a week and a half before an obvious answer occurred to him. The horses would know, in the future, whether they had won or not. Tommy read animals' minds with greater ease than humans. Horses were animals. Ergo—

Next day, which was to be the last day of his bachelordom, he would corral Tommy "for a drive" and let him read the horses' minds as they paraded to the barrier before the race. However, his schemes were upset.

Harriet was moody when he showed up. She spoke miserably of calling off the wedding. And she wept when asked what was wrong.

"I'm sorry, Jeff," she finally dabbed at her face, "I don't usually go off like this. It's just . . . just— Oh, I don't know! . . . little things. But I'm so worried, Jeff. Hold me. Please.

"I don't mean it, about our getting married. But I *feel* things aren't right. Oh, Jeff, I hope it will all be over this Friday when we get married, but—Jeff, I worry about Tommy. He's been so quiet the last two days. And then I had a dreadful dream last night."

"Not about me I hope," murmured Jeff.

"No, Jeff," she smiled briefly. "I dream about you a lot, but this was . . . I can't remember what happened. But it had to do with Tommy, and me—maybe you, too. I just remember waking up and lying there trembling and afraid to move. It was ghastly. I never felt so . . . so terrified. Utterly terrified, and I didn't know why!

"And, well this sounds silly, I know, but I keep thinking of what that congressman said. And yesterday in town there was one of those doomsday repent-ye fanatics talking on a corner. I never paid any attention to them before. But he had a big crowd, and somehow—don't laugh, Jeff—it seemed to fit. And the dream fits. And other things—"

"Harriet, you musn't take it all so seriously. I think it's just part of the general feeling of unrest in the world. There's been a rash of street-corner revivalists in towns over the country. They just seem to spring up to answer a need, an uncertainty in the air. A lot of them belong to no particular sect. They're just the nervous fringe.

"Gosh, alarms about atomic research have been a dime a dozen ever since Hiroshima. Remember the colony that moved into caves somewhere in the Rockies? And then at the back of our minds we all fret about the possibility of war and so forth. You're merely reacting to this general nervousness. Maybe—"

"No, Jeff. Well . . . perhaps—But my feelings seem more personal than the world situation. It seems *near*. I have a feeling something might happen *here*, *tomorrow*, even today. Don't you?"

He didn't answer, but stroked her hand soothingly. Lately he hadn't slept well. He had blamed his distraction on the problem of Tommy. But it was larger than that. Some of the scare neurosis that blared daily from the radio, the TV, and the papers had indeed infected him, he realized. Representative Waddell couldn't be a complete fool, nor were the other congressmen who supported his new investigation. Even a group of scientists had admitted there was danger in the new direction research was taking. In a vague way, Jeff Hawkes was as jittery as everyone else. And if everyone was more disturbed these past weeks—well, where there's smoke, there might well be fire.

Tomorrow, even today! Who knows? Our civilization is so complex. Who would be aware of the real perils that we might be building for ourselves. Atomic missiles from Russia could start a war the next minute. And blow this city right off the map. It would come like that, without warning. World-wide chain reaction? Could the scientists tell for sure it couldn't possibly happen? They used to say atomic energy was beyond their powers, yet in a few years they were playing with it in all sizes and shapes. And Judgment Day—? Did the people believe that forty days of rain and flood were going to start right then when Noah warned them? Not next year, but *today?*

Jeff straightened up. These thoughts were pointless. Yes, true maybe, but morbid. Whereas the immediate task was to cheer up Harriet. Yet the feeling of imminent disaster was hard to dismiss.

"Look now, you pretty up while I catch Tommy. Then we'll all go for a ride, and I'll drop you off for your shopping. Here's a little extra cash, by the way. *Shh*, just take it! Give me that old smile. Darling, I love you."

After dropping Harriet off, Jeff swung the car out to the race track. But his heart wasn't in it. Tommy was so excited, yet it seemed a cheap way to use the kid's ability. There must be some better way Jeff wondered if it was right to keep his knowledge secret. Who would believe, though? There probably wouldn't even be a chance for a fair test and proof. Harriet—wouldn't she simply wax indignant and reject him if he accused Tommy of being odd?

He had given up gambling before he met Harriet and never told her about that part of his life. He realized instinctively that a woman who had shared the ideals of a scientist like Wes would not approve. For fun, yes maybe, but not to gain money. Jeff decided to keep this a sort of experiment. No money, no betting involved.

The experiment was a dismal success. On the way back Jeff was depressed and only grunted yes and no to Tommy's remarks. They left the track after two proofs

of Tommy's naïve mind-reading. Jeff felt it had been a waste of time, for in addition to other reasons against betting, he found the idea of an absolutely sure thing unethical. Moreover, he had hoped to get rid of a problem by proving Tommy to be a normal, fallible little boy. Clearly, he wasn't, Jeff sensed a terror in the face of the dilemma ahead.

They were passing the gas works at the edge of the town when Jeff became aware that Tommy had lapsed into a neglected silence. Suppressing his troubles, Jeff got the boy to talking about the wedding to take place the next day.

Tommy liked his prospective stepfather, and with a youngster's curiosity and enthusiasm for anything new, he had been delighted with the quiet excitement of marriage and honeymoon plans during most of the last week. But as Jeff tried to play up the happiness of their new life together, and also prepare Tommy for the change, Tommy now only fell quieter until, waiting at a stop light, Jeff looked down and saw big tears oozing down the boy's cheeks.

"Here now, fella! What's wrong?"

Tommy kept a grimly stiff lip and slowly pushed out the words, partly with reluctance, partly relieved to ease his troubled heart.

"It isn't going to be like that, Uncle Jeff."

"What do you mean, Tommy?" the man said gently.

"There isn't going to be anything. It's all black after tomorrow." Tommy looked up with puzzled eyes. "I can't hear anything. It's like there was no more world after tomorrow!"

Jeff swallowed painfully. He said vague, feeble things to cheer Tommy, to explain that this meant nothing. To some extent he made Tommy feel that this was acceptable, normal—nothing to be afraid of. But in his own heart there was a cold snake of fright. It writhed, uncoiling itself loop after loop, filling his mind as he drove the rest of the way automatically.

Harriet sensed his fear immediately. When they were alone Jeff went over the whole story as he knew it. Strangely, Harriet accepted the news about Tommy. Perhaps she suspected and had been keeping the suspicions from her conscious thinking. She called Tommy and verified all the incidents: the cases in which she had preferred to believe her son had been a snoopy eavesdropper, the cruel episodes of the other children's fear and rejection of Tommy, the first insecure doubts the child had suffered as he realized that he was "different," alone, and miserable with a sixth sense.

An awe-inspiring calm ruled her, Jeff noticed, as she simulated casual interest in Tommy's vision of the future. Tenderly she encouraged him to talk, to describe what he feared.

Tommy could tell about the modest wedding ceremony, as much as a child would follow of what he has to witness, and about loading and packing the car for the short week-end trip to a lake resort, which Jeff and Harriet had chosen with a mixture of romance and economy. But then the boy broke down and blubbered incoherently. Everything was dark, he couldn't hear." There was fire, it seemed. Or blue things. Once again his mother talked him up to this point, but Tommy's fear shattered his coherence, and it ended in racking sobs as he clutched his mother's neck.

She managed to soothe him and put him to sleep early. Then her self-mastery broke for a minute. Soundlessly she shook, her hands twitching spastically

across Jeff's back as she clung to him desperately. Duty gave Jeff the strength of a protector. A sense of unreality fortified him in the role, numbing his own emotions. And soon it was over.

A queer calm hysteria possessed Harriet. Reserves of control held her in, yet a wild urgency flooded from her to Jeff to fill the hole left by his indecision and lack of will. With a fascinating matter-of-factness, she planned.

"We'll have to go to the mountains; it will be safer than the lake. It was bound to come. It was bound to come. Wesley used to have such terrible qualms about his work. I never understood it. I never understood him either as a wife should. He was so deep. A philosopher. Radiation—he worried about it. He was exposed several times before the last accident. I think he guessed that Tommy was not normal. The world doesn't know what it's doing, Wes used to say. There are no centers to bomb in the mountains. No water like the lake, like Ulokika. I'm sure it was water that did it, Jeff. Wes used to laugh at scare talk and 'uncontrollable chain reactions,' but he was also afraid. Afraid it would come in a different way. He talked in his sleep a lot, you know.

Everything the next day was hasty. Tommy was gay, reassured by his trust in grown-ups' authority and greater wisdom. A fantastic certainty, with half a hope, carried Harriet and Jeff through the various tasks of getting ready for an exodus to the mountains. They didn't pause to consider whether they could escape the fire and black nothingness Tommy predicted, nor whether the mountains were really safer than another place. The little wedding was quickly over.

Harriet stumbled on Tommy's spaceship as they entered the car. Tommy was in back but wanted to sit in front. Jeff helped him clamber over the seat back. The minister and his wife waved, smiling. They were off.

Jeff drove with fierce efficiency and speed. In no time the city was behind them. Countryside rolled past unnoticed. Only the trucks and other automobiles cluttering the road before them produced any impression. It was like speeding to a hectic picnic. Invisibly over their heads hung the lithium bomb. Jeff was tensed to expect behind him the explosion that meant the city had disappeared, Harriet expected rather to see some terrible radioactive disintegration creep swiftly across the landscape, like the browning edge of a newspaper on fire.

The car behind them honked.

"The fool, passing on a curve," cried Jeff, the first words either had spoken for a half hour. Jeff speeded to keep ahead.

Tommy had fallen into a doze between them on the front seat. He leaped up suddenly, like a marionette, to see what the excitement was. And then it happened.

The other car tried to pull in front of Jeff. It was sandwiched by Jeff and the huge gasoline truck which suddenly barreled toward them around the curve. The passing car folded. The truck took the rest of the curve badly, toppling against both automobiles, its gasoline pouring in fire across the highway. Tommy pitched through the windshield. Jeff found himself pushing Harriet out, onto the shoulder of the road. Their figures tumbled down an embankment to safety.

"Tommy!" shrieked Harriet, vaguely aware she was still alive.

But the black nothingness had already closed in on the boy's vision, as the burning wreckage incinerated the small corpse lying on what had been the hood of a car. The flames crackled loudly along the blue paint on the gas truck, blistering and peeling it above him.

THE END

"MY WILLIE CAN DO ANYTHING"

Continued from page 5

Essentially, we could define a postulative difference as differing from a semantic difference in this: postulates are different when, and only when, the logically deduced conclusions based on them are either mutually exclusive, or not mutually inclusive; i.e., if the conclusions logically deduced do not show a full, one-to-one correlation.

If that situation arises, both groups are being honest, sincere, and logical—and are in disagreement at a level neither pragmatism nor logic can reach.

Note that a psychotic paranoid, a really, unquestionably raving-mad paranoid, can be perfectly and completely logical. He's logical, but irrational. He's an extreme example; be it noted that *Euclidean geometry is logical but irrational.* Its postulates are intuitively true—and incorrect. It doesn't fit the actuality of curved space, but the departure is absolutely unobservable in any normal human experience.

Then, any Society which holds that logic and pragmatism can solve any problem is working on a false postulate; it, like Euclidean geometry, is logical but irrational. Its system will not fit the actuality of real living-space.

Such a Society will repeatedly encounter the situation of two groups which, by reason of widely different background experience, have different postulate systems, which cannot be brought into agreement by logic. Reduced then to pragmatic test, War is the automatic and inescapable conclusion—within that limited, logic-pragmatic system.

It's readily observable that any intelligent entity wants its acts to yield the consequences it chooses, and none it does not choose to have. A man wants his statements to mean what he wants them to mean, and nothing else. He doesn't want "to be misinterpreted." And a man will "feel he is being misunderstood" any time someone points out that the consequences of an act entail not only those effects he wants, but equally, effects he decidedly does not want. Herr Hitler, for instance, was terribly misunderstood—according to Herr Hitler. He repeatedly said he didn't want war; he just wanted Poland. A man, a group, a Society, will insist it is all "misunderstanding" when consequence B is shown to be entailed by the act which is intended to generate consequence A only.

Our Society, is insisting on Logic and Pragmatism, has entailed certain consequences which are "misunderstandings"; Society does *not* want war. Nobody

suggests that Society wants war. But War, like it or not, is an entailed consequence of trying to settle all disputes by logic and/or pragmatism alone.

The fact that a desirable consequence A can entail an undesirable, and even disastrous consequence B, is one of the things an engineer gets beaten into him very solidly—and has to accept, whether he likes it or not. But he *knows* he has to accept it. Society has not yet achieved that recognition.

There's a magnificent example of precisely that mechanism that explains why we have hydrogen-lithium bombs, and why the next war will use them. Inescapably!

First, the next war will result from failing to acknowledge that logic and pragmatism alone cannot solve real-space living problems. Then we can expect that if we have another war, it will be in a system that insists on being logical and pragmatic *only*.

The essential function of War in such a system is to force a change in the opinions of the policy-making group on the other side. If Group A disagrees with Group B, and finds that Group B's opinions-beliefs-postulates lead to actions which oppose A's, then A wants to end that opposition.

Now if the policy-making group is a King, as in the old days, then we have the situation of chess; capture the king, and the problem is solved. If it's an aristocracy system, then if the aristocrats can be bought, cajoled, flattered or otherwise persuaded, the desired effect is achieved. Killing them off will, of course, equally end their opposition. Suitable weapons for either punishing them enough to make them yield, or killing them, will be swords, clubs, or pistols.

But when we consider a policy-making group of hundreds of millions of people, we have a different problem. Punishing a hundred million people calls for something different. And in a true democracy, that's what the logic of war calls for. The *policy making group* is the group which must be punished (it says here) until a change of opinion results.

It is both necessary and sufficient to alter the opinions of the policy-makers; in a democracy, the government and military forces are merely executive branches, truly servants of the people. It is *neither* necessary nor sufficient to change their opinions. Therefore punishing the military forces is an inefficient, and wasteful procedure; the military forces are not the policy-makers—as they were in the days when Knighthood was in Flower.

Civilian bombing, and techniques of mass-misery production, then, appear not as unfortunate and unkind visitations of a malign Fate; they're one of the entailed consequences of a system of beliefs which includes punishment as the only way of changing opinions, and democracy as a form of government. *If* a system of logic holds that punishment is necessary, *and if* the citizens of the opposing nation are the policy-makers of that nation, *then* logically the citizens, not the military, must be punished until they change their opinions.

In terms of this type of thinking, the logical conclusion is that it is necessary to devise techniques capable of effectively punishing tens of millions of people at a time.

The mass bombing of cities, started in World War II, was the logical consequence of the thought-postulates of culture. "I didn't want to, but I had to," is the reaction of an individual trapped in the entailed consequences of his own acts.

The atomic bomb was the logical outgrowth of this same system of thought.

Because the physicists did the actual work, the citizens tend to hold them responsible for the device. In a sense, they are. But if it hadn't happened that the physicists were about ready to release atomic energy—see the July, 1938 editorial in this magazine—consider what would have happened.

We know that biological warfare was almost ready for use; greater efforts would have been expended in that direction. Biological warfare, too, is admirably adapted to fulfilling the assumed-necessity of punishing tens of millions of people.

Also, the chemists and biochemists have been approaching the same goal. The insecticides and wonder-drugs that have been developed are enzyme-inhibitors or mis-activators. Nerve gases now available indicate the direction of research. It's almost certainly *possible* to develop a gas or mist with hyper-heroine like properties which, instead of killing, simply converts the victims to violently addicted slaves. Withholding the gas would then very effectively cause changes of civilian opinion.

Perhaps we're really very fortunate that the physicists were so far along; atomic bombs do make for a fairly clean sort of destruction of human personalities.

There is a simple—and I *do* mean simple-minded—logic behind the development of devices for the mass production of misery.

So long as we hold that "They must be taught a lesson" is equivalent to "They must be made so utterly miserable they'll change their opinions in sheer horror" we're apt to have some consequences entailed that we feel are "misunderstandings." "I didn't want to, but I had to," simply means you didn't realize that *all* the consequences of your act had to be fulfilled—not just the ones you wanted.

What do we do about it?

I think the answer is fairly clear. We're going to have to recognize that something beyond logic does exist, and we're going to have to study it, fast, hard, and however painful it may be. The whole orientation of our past has been "Intuition and feelings are nonsense and irrational." Breaking through that is going to be mighty hard—almost as hard as the gamma radiation of a hydrogen bomb.

And don't depend on the horror of atomic war to stop Man; Man is where he is because no threat, no horror, has ever stopped him. Sure, he's afraid of the Unknown—that's why he has to keep attacking it and converting it into the Known! Threat of retaliation does not stop Man, and never has; it just makes him hesitate while he makes sure there is no less unattractive way of going where he was going anyway. A machine-gun nest doesn't stop men; they just hesitate long enough to make sure that they actually have to undertake the dirty job of digging the thing out. Then they charge up a barren hillside, where there is no cover, and try to get that gun. They usually do, too.

Dying for a principle is no remarkable feat, characteristic only of rare, marvelous heroes. If it were, you couldn't have armies of millions of men willing to take the chance of doing precisely that.

But it's so damned futile to die for a false principle! The Principle that Logic Can Solve Any Problem.

THE EDITOR.

THE REFERENCE LIBRARY

By P. SCHUYLER MILLER

STAPLEDON REVISITED

ONE of the publishing events of 1953 was "To the End of Time," the omnibus volume by Olaf Stapledon with which Funk & Wagnalls surprised the science fiction world (775 + xiv pp., $5.00). It contains Stapledon's four greatest books: "Last and First Men," "Star Maker," "Odd John," "Sirius," and also "The Flames." Of these, "Last and First Men" and "Odd John" originally appeared in this country as well as in England, and FPCI brought out "The Flames" in 1949 in a volume, "Worlds of Wonder," which included "Death into Life" and "Old Man in New World." (The latter were published by FPCI last year, with Murray Leinster's "Murder Madness," in a book called "Quadratic," for $3.50.)

Although the book took some time to catch up with me here in Pittsburgh, you'd have heard about it months ago but for one thing: I found it unreadable. You're hearing about it now for another reason: I found out why.

Let me qualify what I've just said. To me Stapledon's story of the super-intelligent mutant sheep dog, "Sirius," is by far his most readable book as Sirius is his most "human" and believable character. "Odd John" comes next, though I know that many readers find John altogether too odd and unhuman for them to make any identification with him. He is by no means a "hero" in the sense of the usual *Homo superior* protagonist of current science fiction.

Both of these books held my attention, when I came to them about two-thirds of the way through "To the End of Time," as well as they have ever done. But this omnibus which Basil Davenport has selected-edited begins with Stapledon's best-known and probably greatest book, "Last and First Men," and follows it with the sequel (which I have never read) "Star Maker." And here I stuck fast.

Now, I remembered "Last and First Men" as a work of breath-taking im-

aginative power which sweeps through the future of mankind for some two billion years. John Campbell has said of it: "Olaf Stapledon's science fiction is beyond the ordinary meaning of science fiction—a most remarkable extension of man's history and philosophy toward a visualization of the ultimate goals of life." Yet I found myself unable to turn the pages.

Then I learned the reason: my own reading habits.

By necessity and (now) habit I do most of my reading in fits and snatches, with meals, on the trolley, late at night, with a few clear stretches on a weekend. I've long known that solid, serious books, fiction or non-fiction, can't be read in this way and my reading has suffered. It's a method that's fine for light, fast-moving fiction like detective stories or most science fiction—anthologies, of course, have their built-in breaks—but every now and then when I get well started on a new—or old—book of history, or archeology, or science, I find there's no way to read it except by ignoring all else, including the newspapers, until it's done. (That's when this department gets behind schedule and John Campbell begins to squirm.)

One of the winter's assorted bugs caught up with me, I spent a couple of days at home, and after going through five mysteries in one very long Thursday I picked up Stapledon again. *And I couldn't put it down!*

You can't read Stapledon in little bits. But once you've let the pace of "Last and First Men" pick you up, you'll find it carrying you irresistibly on as a kind of remote spectator watching the rise and fall, birth and death of races. And in "Star Maker" that sweep of imagination encompasses the entire evolution of the universe, human and nonhuman, and introduces Stapledon's concept that life is a property of all energy-converting entities, from a flame in a Welsh hearth to the assemblages of galaxies which swim through space. ("The Flames" is a kind of vignette in the same grand pattern, but a very minor one.)

It is amazing that other writers of science fiction have not made more use of Olaf Stapledon's tremendous panorama, as an entire school developed Lovecraft's synthetic mythology. Many have struck on the same ideas and themes, but so far as I know nobody has ever tried to fit his stories into the pattern of Stapledon's future as Robert Heinlein, or Isaac Asimov, or Clifford Simak, have done with imaginary futures of their own. When I commented, some time ago, that James Blish's "Surface Tension" was a variation on one of Stapledon's themes I meant only its concept of a human race deliberately engineered and bred to suit an utterly alien environment. "Man Remakes Himself" is the title of Chapter XI of "Last and First Men" and the theme of all the rest of that book and most of "Star Maker."

For those of you who have no idea of what these books are like, I suppose I'd better attempt a synopsis. "Last and First Men" was written in 1929: it is the history of mankind from the end of the first World War until the end of man, reported telepathically by one of the Last Men of two billion years hence. (The predictions for the period of our lifetimes have been omitted in this edition.)

An American world state develops, exhausts its resources and collapses. Plague wipes out great masses of the population, then here and there in remote places new, isolated variants on the human species begin to develop: "During the first tenth of the first million years after the fall of the World State . . . man remained in complete collapse. Not till the close of this span, which we will call the First Dark Age, did he struggle once more from savagery through barbarism

into civilization. And then his renaissance was relatively brief. From its earliest beginnings to its end, it covered only fifteen thousand years; and in its final agony the planet was so seriously damaged that mind lay henceforth in deep slumber for ten more millions of years. This was the Second Dark Age." And this is the matter for *two chapters* in "Last and First Men." As the incredible story unfolds, we are dealing with new species of men as strange as any recent science-fictioneers have used to populate alien world: the furry little Third Men, the Great Brains, the android Fourth Men, the giant Fifth Men, the migration to Venus and development of the winged Seventh Men, of the Ninth Men designed to live on Neptune and the evolution there of ten more human species, and the Eighteenth and last who tell the story.

Where "Last and First Men" followed the human race to its end, "Star Maker" follows its narrator on a mental wandering through all space and all time, among races human and nonhuman, to the knowledge that stars, planets, galaxies, galactic swarms—all have life and intelligence, and that creation follows creation and cosmos builds on cosmos through an infinity of time, space and dimension.

In the very short "The Flames" one of these sentient sun-children, trapped in the solidifying earth and now freed by miners, reveals another facet of this vision of cosmic consciousness. A fourth book, not in this collection nor, so far as I know, published in the United States, is "Last Men in London," in which a Last Man looks at our civilization with a two-billion-year perspective. "Death into Life"—in the FPCI "Worlds of Wonder" or "Quadratic"—goes over much the same ground from a still different point of view.

As Basil Davenport points out in his introduction to "To the End of Time," the ideas in his major books are their characters, and races and aeons of time replace individuals and days. Only "Odd John" and "Sirius" have semiconventional plots, conversations, action. But no writer who has ever come into the science-fiction-fantasy field has ever shown so vast and encompassing an imagination. If you can match your pace to his, you're in for an experience.

SCIENTIFIC AMERICAN READER. Simon and Schuster, New York. 1953. 626 pp. $6.00

The resurrection in May 1948 of the old *Scientific American*, long degenerated into a collection of industrial press-releases, as a distinguished review of modern scientific thought and achievement is an event which ranks with the appearance of the first issue of *Amazing Stories* twenty-two years before, or John Campbell's appearance on the masthead of this magazine.

Articles on every field of science are written by leading authorities, handsomely and appropriately illustrated, and supplemented with probably the best long reviews of scientific books now being published. In this "Reader" Simon and Schuster have now brought together fifty-seven of the best and most representative articles from the first five years of the "new" magazine.

The first two sections deal with "Evolution in Space" (5 articles) and "Structure of the Earth" (3); these are supplemented with "Structure of Matter" (5) and "Atomic Energy" (6). The rest of the book deals with Life and Man: "Origin of Life" (4); "Genetics" (6); "The Virus" (5); "Stress" (4); "Animal Behaviour" (5); "Origin of Man" (5); "The Brain and the Machine" (5 articles); and, finally, "Sensation and Perception" (4 articles).

I miss three things in the book: the illustrations which are so important an adjunct of every *Scientific American* article (a few are reprinted); the short bibliographies which normally accompany each article and send the serious reader to the sources; and, perhaps trivial, a section on human culture, drawn from the excellent short articles on archeology which the magazine prints from time to time. There should also have been a section on mathematics. But what do you want for $6.00—the *Britannica?*

OUR NEIGHBOR WORLDS, by V. A. Firsoff, M.A. Philosophical Library, New York. 1953. 336 pp. Ill. $6.00

This is one of a number of books by foreign authors—Mr. Firsoff is apparently a British astronomer—which have been coming from Philosophical Library. They're books you're not likely to find anywhere else, but they're apparently published in such small editions that the price is unduly high—this certainly need not have been on highly enameled paper.

I know nothing about the author's standing as an astronomer, and the jacket tells you nothing. But the book is fresh in its approach to space flight and the details of the Solar System, and unless there are serious misstatements of fact it should provide an excellent reference for anyone, reader or writer, who wants neat epitomes of the conditions on the planets and their satellites. The frontispiece has two color drawings of Mars and one each of Jupiter and Saturn.

You'll find Mr. Firsoff unorthodox in some views and inclined to see a possibility of water, air and life just about anywhere. You'll also find that he ignores such things as the dust-cloud theory of Weizsäcker and others to present his own version of the origin of the planets in the twice-repeated explosion of a nova, throwing out shells in which the elements are somewhat segregated by atomic weight, yielding worlds with duly graded densities and compositions.

The author's style is light, almost flippant in spots, but he cites his references meticulously and it seems to me he's used quite a few, both for his rocketry and his astronomy, which American writers have overlooked. I liked the book.

THE GREEN MILLENNIUM, by Fritz Leiber. Abelard Press, New York. 1953. 256 pp. $2.75

When a bright green cat strolls into the room and life of nonentity Phil Gish, that unfortunate but obstinate young man has no idea of the entanglement of plot and counterplot, murder and mayhem which will presently be woven around him. (Not the least of his adventures will be one with a young lady who takes off her legs when she goes to bed.)

This is the vicious society of our not too-far future which Fritz Leiber has shown us even more convincingly in such short stories as "Coming Attraction." Its assorted members want the cat, and will stop at very little to get it. They include male-and-female wrestlers, psychiatrists, gangsters, cultists, a witch, thoroughly vicious juvenile delinquents, robots, and assorted Federal bureaus. The chase rattles back and forth with bewildering speed and increasing confusion until all the opposing forces mingle in one last free-for-all.

Filmed by someone with a proper sense of the outrageous, this would make a grand sf movie. Of course, they'd have to tone down some of the costumes . . .

Meanwhile the Leiberian attention to setting makes it far more convincing than any of the sf-mystery hybrids I have yet seen.

THE TRITONIAN RING, by L. Sprague de Camp. Twayne Publishers, New York. 1953. 262 pp. $2.95

Once Sprague de Camp decided to invent a Bronze Age world full of gods, demons, uninhibited women and fast swordplay he set about it with all the thoroughness which might be expected of the creator of Viagens Interplanetarias. The result is a series of stories in the mood of Howard's "Conan" but with a flavor all their own.

In the long title story, Prince Vakar of Lorsk sets out on a kind of Cook's tour of the world of his time, seeking the unknown thing "the gods fear most" with quite active opposition from some of them and their agents. In "The Stronger Spell," one of three shorts laid in the same times which complete the book, a deliberately anachronous invention is put in its place. Then there's the pleasantly inept sorcery of young Gezun Lorska, a hulk of fourteen, in "The Owl and the Ape" and a Dunsanian misadventure with an idol's eye in "The Eye of Tandyla."

For pure swashbuckling fun with a touch of bawdiness as befits the uninhibited Bronze Age, "The Tritonian Ring" is recommended. I call it pure fantasy; you may like it as an alternative world.

TALES FROM GAVAGAN'S BAR, by L. Sprague de Camp and Fletcher Pratt. Twayne Publishers, New York. 1953. 228 pp. $3.00

We don't have much to do with straight fantasy here, but it would be a downright disservice not to call your attention to this compendium of over-the-bar confidences, only part of which have been published in *Fantasy and Science Fiction* and *Weird Tales.*

The closest things to these tales from Gavagan's—rhymes with "a pagan's"—are the occasional commentaries by Lord Dunsany's widely traveled friend Jorkens (I am unhappy to say that I have never learned what happened on the occasions when "Jorkens Had a Large Whiskey"). But those were the misadventures of one man, and these are things which have happened to people as different as an automobile salesman ("Corpus Delectable")' a drummer in toys ("Beats of Bourbon"), an attorney ("The Black Ball"), and a woman married to a were-dachsel ("Here, Putzi!"). My own favorite is still the classic "Elephas Frumenti." The jacket is decorated with the only perfect portrait ever made of a pair of co-authors, and my only regrets have to do with the chapters which are *not* decorated by "Inga"—who is otherwise Mrs. Pratt.

THE WHITE WIDOWS, by Sam Merwin, Jr., Doubleday & Co., New York. 1953. 224 pp. $2.95

This mixture of science fiction and mystery never quite becomes believable and isn't even up to the author's recent "Killer to Come" for Abelard.

Larry Finlay, who has made certain discoveries about hemophilia, finds that he is being hounded out of his D.Sc. at Harvard and into a murderous frame-up for mysterious reasons. He is rescued by a fat genius, beset by numerous beautiful girls, and used as bait in a women's conspiracy to found a manless world. Least plausible of his exploits is his "submitting" a thesis to Columbia as he might have submitted a story to Sam Merwin, editor, with the expectation of getting a doctorate by return mail. Granted this is set somewhere in the future: universities won't have changed *that* much. Nor do men drop wholesale in their tracks as the jacket artist believes—that was in Jerry Sohl's "Haploids."

Nope—Merwin can do better, and undoubtedly will. Wait around.

E PLURIBUS UNICORN, by Theodore Sturgeon. Abelard Press, New York. 1953. 276 pp. $2.75

Every time some newcomer is hailed as *the* master of modern science-fantasy some publisher remembers to bring out another book by Theodore Sturgeon and faces are red again in critical circles.

This collection. Sturgeon's first since "Without Sorcery" in 1948, is predominantly fantasy. You'll find straight and thoughtful science fiction in "A Saucer of Loneliness" (a poet's version of the song the saucers sing), "The World Well Lost" (who but Sturgeon would have handled this so movingly?), "It Wasn't Syzygy" and its grim companion on the same theme, "The Sex Opposite," and I suppose the ugly "Cellmate." "Scars" is a tight little story of a man and a woman in the West; "Die, Maestro, Die!" follows the growth of an obsession: these are "straight" stories with all the Sturgeon humanity and inhumanity in them.

And the fantasies? "The Silken Swift" retells the unicorn myth as beautifully as it has been done. "A way of Thinking" strikes at the vulnerable heart of witchcraft. And "The Professor's Teddy Bear," "Bianca's Hands," "The Music," and "Fluffy" are hideous with a kind of mad perversion of the familiar into the terrible.

Did I say predominately fantasy? Perhaps because of the touch of poetry in every story. This, as was "Without Sorcery," is one of the finest short story collections by any writer in the field.

CONQUEST OF THE MOON, edited by Cornelius Ryan. Viking Press, New York. 1953. 126 pp. Ill. $4.50. (Published in Gt. Britain by Sidgwick & Jackson under the title *Man on the Moon*. 25s.)

Here's one I had to buy for myself because the review copy, I suspect, went right into your editor's reference library where it belongs.

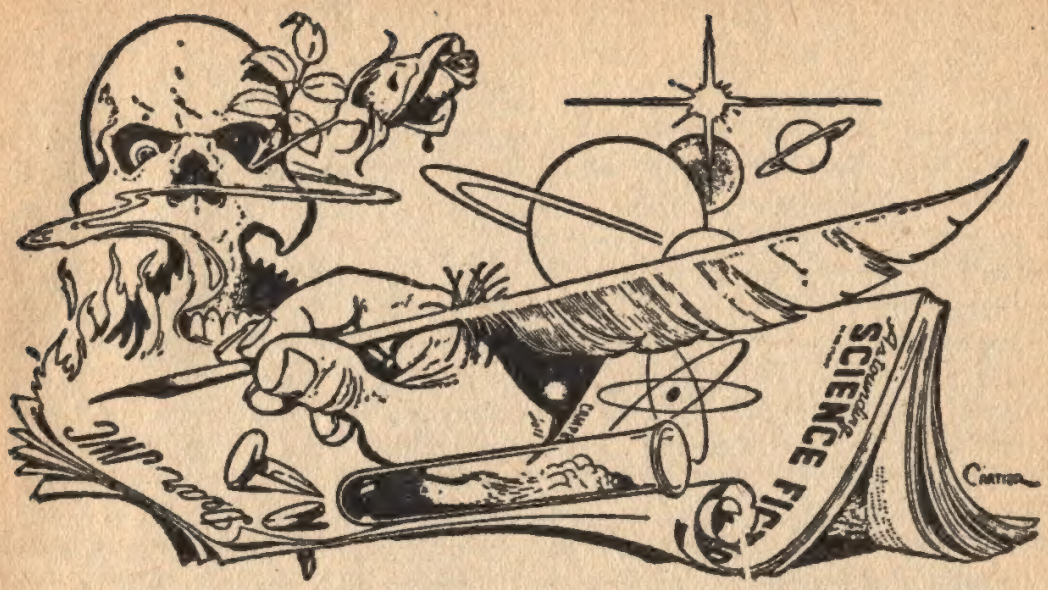
If you saw the *Collier's* symposium of which this is an amplification, you'll know that the book is a companion to "Across the Space Frontier." Wernher von Braun, Fred L. Whipple of Harvard, and Willy Ley were the contributors; Chesley Bonestell, Rolf Klep and Fred Freeman made the striking illustrations.

This is a sort of large-scale, color-illustrated supplement to Von Braun's "Mars Project," which was described here a short time ago. Like the latter book in everything but magnitude of detail, it explains step by step how we can (the book uses "will") go to the Moon from the space station described in the former volume, how we will land, how we will explore, how we will return.

I personally believe that this kind of all-out twenty-five-man expedition is too big, just as von Braun's ten-rocket Mars expedition looks unwieldy and expensive out of all proportion to what it could accomplish. I don't go for the ultra-specialization he requires, for example: though it's probably true that it's too late to find or train the multiple specialists such a job would require, and get on the Moon by 1978 (no, by all that's spacely: that's twenty-four years and a course could be set up in MIT or Cal Tech to make the multi-talent scientists by take-off time!).

I hope *Collier's* and Viking go on to the Mars Project, too.

THE END



BRASS TACKS

Dear John:

I have received more than one letter from readers questioning whether beryllium is really as dangerous as I make it out to be in my story "Sucker Bait." Beryllium is used in alloys and two per cent of it, added to copper, gives copper a remarkable springiness. I am certain that, with the proper precautions, beryllium can be handled safely. However, certain beryllium compounds and beryllium-zinc compounds, formerly used as phosphors in fluorescent lighting fixtures were and are every bit as poisonous as I stated them to be in "Sucker Bait." It is, I think, legitimate auctorial license for me to assume that the beryllium in the soil of Junior was in the form of those compounds without lengthening my chemical exposition at the end of the story to prohibitive degree.

It may interest many readers to know, by the way, that this is the way *The Merck Index of Chemicals and Drugs* (6th edition, 1952) speaks of the toxicity of beryllium. I quote directly:

"Death may result from short exposure to incredibly low concentrations of the element and its salts. Concomitant exposure to acid (hydrofluoric) fumes may increase toxic effect. Contact dermatitis, chemical conjunctivitis, corneal burns, nonhealing ulceration at site of injury, subcutaneous nodules. Acute: pneumonitis may result from single exposure to beryllium and occasionally is fatal. Chronic: pulmonary granulomatous disease may appear in three months to six years, often after short exposure to low concentration. Uncertainty as to complete recovery. Death rate about 25%."

Following the element beryllium, the Merck Index lists twenty-four beryllium-containing compounds from beryllium acetate to beryllium sulfate. For each one of these without exception, the comment under the heading: Toxicity is: "See Beryllium."—Isaac Asimov

Beryllium is even more deadly when produced by the nuclear reaction $Li^1 + H^7 \rightarrow Be^8 \rightarrow 2He^4$*—the so-called "hydrogen bomb" reaction.*

Mr Campbell:

A Dr. Biskind, of Westport, Connecticut, reports in *American Journal of Digestive Diseases*, that DDT has brought on new diseases. In men there are liver disorders, polio, heart and artery disorders, cancer, several kinds of pneumonia, gastro-intestinal disorders, plus a sort of blanket fatigue and muscular weakness.

Man's domestic animals, usually free of cardiac difficulties, have troubles of their own with a mysterious malady known as "X" which attacks cattle; more and more hoof-and-mouth disease; vesicular Examthemata in pigs; blue tongue in sheep; plus scrapie; Newcastle in chickens; "hard pad" in dogs.

All but hoof-and-mouth, Dr Biskind points out are so new they don't appear in the 1942 issue of "Keeping Livestock Healthy," the Department of Agriculture handbook.

We are having a battle here about flouridation of the water supply. It was shoved down our throats in a perfect socialistic gesture. Seeing that a healthy proportion of sf readers are professional chemists and toxicologists, maybe some of them could—or have—correlate some tests on accumulation, toxic thresholds, possible toxic effects at various degrees of accumulation. It may not help us in our town, but may help others to prevent such future occurrences. A point that might be interesting is the combination of fluorine with chlorine, calcium, and other normally water-contained minerals.

The big question is "Is it safe?" Or not? What about long-term and genetic effects?—Smokey McGee, 28 3rd Avenue S., Moorhead, Minnesota.

Any one got data on this?

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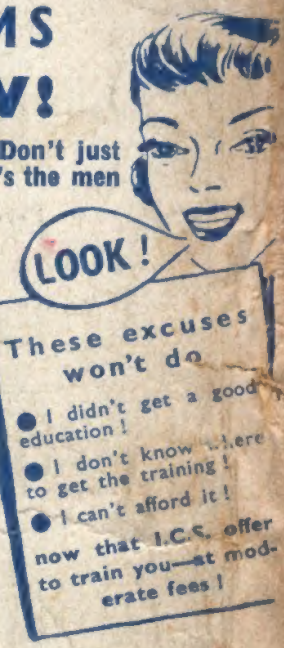
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